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To cite this article: Peter Salovey, Laura R. Stroud, Alison Woolery & Elissa S. Epel (2002) Perceived Emotional Intelligence, Stress Reactivity, and Symptom Reports: Further Explorations Using the Trait Meta-Mood Scale, Psychology & Health, 17:5, 611-627, DOI: 10.1080/08870440290025812

To link to this article: http://dx.doi.org/10.1080/08870440290025812

Published online: 27 Oct 2010.

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PERCEIVED EMOTIONAL INTELLIGENCE, STRESS REACTIVITY, AND SYMPTOM REPORTS: FURTHER EXPLORATIONS USING THE TRAIT META-MOOD SCALE*

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We examined the relationship between perceived emotional intelligence (PEI), measured by the Trait Meta-Mood Scale (TMMS), and psychophysiological measures of adaptive coping. The TMMS assesses perceived ability to (a) attend to moods (Attention), (b) discriminate clearly among moods (Clarity), and (c) regulate moods (Repair). Study 1 showed significant positive associations between PEI and psychological and interpersonal functioning. In Study 2, skill at mood Repair was associated with less passive coping and perceptions of repeated laboratory stressors as less threatening; Clarity was related to greater increases in negative mood, but lower cortisol release during repeated stress. In Study 3, Repair was associated with active coping and lower levels of rumination; Attention was associated with lowered cortisol and blood pressure responses to acute laboratory challenges. These findings suggest that psychophysiological responses to stress may be one potential mechanism underlying the relationship between emotional functioning and health.

Keywords: Emotional intelligence; Health; Stress reactivity; Coping

Individuals differ in the skill with which they can identify their feelings and the feelings of others, regulate these feelings, and use the information provided by their feelings to motivate adaptive behavior. These competencies have been organized into a framework called emotional intelligence (e.g., Salovey and Mayer, 1990; Mayer and Salovey, 1993, 1997; Salovey \textit{et al.}, 2000; Salovey \textit{et al.}, 2001). An important aspect of emotional intelligence is the ability to reflect upon and manage one's emotions. Mayer and Gaschke (1988) demonstrated that individuals continually reflect upon their feelings by monitoring, evaluating, and regulating them. They termed this process the...
meta-mood experience and developed what is now called the State Meta-Mood Scale to measure individuals’ moment-by-moment changes in reflections about ongoing moods.

In order to measure more stable individual differences in the qualities of the reflective mood experience, Salovey and colleagues (Salovey et al., 1995) developed the Trait Meta-Mood Scale (TMMS). The TMMS is composed of three subscales: (a) Attention – perceived ability to attend to moods and emotions, (b) Clarity – perceived ability to discriminate clearly among feelings, and (c) Repair – perceived ability to regulate moods. Past research from our laboratory has shown links between perceived emotional intelligence (PEI) as measured by the TMMS, and both psychological responses to stress and physical health. In one study, individuals who were high in Clarity showed greater rebound from induced negative mood and greater decline in ruminative thought following an experimental stressor compared to individuals who were low in Clarity (Salovey et al., 1995). In another, individuals who were higher in Attention reported higher levels of physical symptoms, but individuals who perceived themselves as skilled at mood repair reported fewer illnesses (Goldman et al., 1996).

In general, it appears that greater PEI, as assessed by the TMMS subscales, is associated with fewer physical symptoms and more adaptive reactions to stressors. It may be that individuals who can clearly perceive their feelings and believe they can repair negative mood states turn their attentional resources toward coping and minimizing the impact of stressful events. On the other hand, individuals low in Attention, Clarity, and Repair may engage in extended rumination in order to understand how they feel. Rumination and the absence of attempts to attend to, clarify, and repair mood may then lead to prolonged physiological arousal and negative health outcomes (Nolen-Hoeksema et al., 1994; Gross, 1998).

Although we have demonstrated relations between PEI and physical symptoms as well as between PEI and psychological responses to stress, little is known about psychophysiological mechanisms underlying these associations. One construct that has been linked to both emotion regulation and health, and thus represents a potential underlying mechanism, is physiological responses to stress. Physiological responses to stress are believed to involve two systems: the hypothalamic pituitary adrenocortical (HPA) axis, and the sympathetic axis. Activation of the HPA axis results in the secretion of cortisol from the adrenal cortex into circulation. In the short term, cortisol both increases arousal and defends against the body’s own stress reaction. However, chronic over-exposure to the HPA stress response can itself damage many regulatory systems (McEwen, 1998; Sapolsky et al., 2000). Activation of the sympathetic axis typically leads to symptoms of arousal including cardiovascular changes (e.g., increased blood pressure and heart rate). Although there are conflicting views of what constitutes adaptive HPA and sympathetic responses to stress, large increases in physiological responses to acute stressors as well as the lack of ability to habituate to chronic stressors may over time damage organs and lead to disease (Manuck and Krantz, 1986; Dientsbier, 1989; Ratliff-Crain and Vingerhoets, 1996; McEwen, 1998). Given evidence for the relationship between PEI and both health and psychological responses to stress (Salovey et al., 1995; Goldman et al., 1996), and the importance of emotion regulation in determining physiological stress reactivity (e.g., Nachmias et al., 1996), we predicted that greater PEI will be related to adaptive physiological responses to stress.

Another construct related to both emotion regulation and health is coping. Coping has been conceptualized as an individual’s pattern of response to external negative events (Carver et al., 1989). Active coping is arguably more adaptive, and refers to
active steps to change a stressful situation or to ameliorate its effects including both emotion and problem-focused strategies. Passive coping, arguably less adaptive, refers to giving up, avoiding, or inhibiting an active response. Given links between coping and psychological and physical functioning (e.g., Weinberger, 1990), we also examined the relation between PEI and state and trait coping. We believe that Attention, Clarity, and Repair are essential ingredients for active coping, which involves both engaging with emotions, then managing them in order to change the situation. Although emotion-focused strategies have previously been linked with passive coping, PEI focuses on the tendency to engage with emotions, rather than avoid them. Thus, we hypothesized that greater PEI will be associated with greater active coping and less passive coping.

In the present series of studies, we re-examined relationships between PEI and psychological and physical functioning, extending these findings to interpersonal relationships (Study 1). We then investigated the relationships between PEI and psychophysiological measures of coping with stressors in an effort to elucidate potential mechanisms underlying the relation between PEI and health (Studies 2 and 3). The central thesis of this research is that attention to moods, clarity in perceiving mood, and confidence in one’s ability to repair negative mood are critical for adaptive psychophysiological coping and subsequent well-being.

STUDY 1

In Study 1, we re-examined relationships between PEI and measures of psychological and physical functioning. We expected that high Attention, Clarity, and Repair would be positively associated with self-esteem and negatively associated with physical symptom reporting, and depression. We also examined the relationship between PEI and three measures of interpersonal functioning, empathy, social anxiety, and general interpersonal satisfaction. We expected that greater PEI would be related to greater empathy, lower social anxiety, and greater satisfaction in interpersonal relationships (e.g., Mehrabian and Epstein, 1972; Gottman and Levenson, 1986; Cooper et al., 1998).

Method

Participants

Participants were 104 undergraduates (29 males, 71 females, 4 unknown), ages 16–23, who were recruited from an Introductory Psychology course, and received course credit for their participation.

Procedure

Participants completed a packet of questionnaires including the TMMS as well as questionnaires measuring empathy, social anxiety, self-esteem, depression, physical symptoms, and interpersonal satisfaction.
Measures

Trait Meta-Mood Scale The TMMS is a 48-item, self-report measure designed to assess individuals’ beliefs about attending to moods (Attention), the clarity of their own experiences of mood (Clarity), and their efforts to repair mood states (Repair) (Salovey et al., 1995). The Attention scale includes items such as, “I pay a lot of attention to how I feel,” and “I don’t think it’s worth paying attention to your emotions or moods.” The Clarity scale includes items such as “I am usually very clear about my feelings” and “I can’t make sense out of my feelings.” The third subscale, Repair, reflects individuals’ efforts to repair negative mood by maintaining a positive outlook. This subscale is characterized by items such as: “When I become upset, I remind myself of all the pleasures in life” and “I try to have good thoughts no matter how bad I feel.” The TMMS has been shown to have adequate internal consistency and good convergent and discriminant validity (Salovey et al., 1995). Cronbach alphas for this study are reported in Table I.

Empathy Empathy, or capacity for emotional sensitivity, vicarious arousal, and the identification of affect in others, was measured using the 33-item Mehrabian and Epstein (1972) measure of emotional empathy. Cronbach’s alpha in this study was 0.74.

Social Anxiety Social anxiety, or discomfort in the presence of others, was measured with the Social Anxiety Subscale of the Self-Consciousness Scale (Fenigstein et al., 1975). This 6-item scale included items such as “It takes me time to overcome my shyness in new situations,” and “I feel anxious when I speak in front of a group” measured along 5-point scales. Cronbach’s alpha was 0.72.

Self-Esteem Self-esteem, defined as global feelings of self-worth and self-acceptance, was measured using the 10-item Rosenberg (1965) Self-Esteem Scale with standard four-point scoring. Cronbach’s alpha was 0.87.

Depression Depression was measured with the Center for Epidemiologic Studies Depression Scale (Radloff, 1977). This scale includes 20 items assessed along 4-point scales measuring various components of depression including: depressed mood, feelings

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean (SD)</th>
<th>Alpha</th>
<th>Attention</th>
<th>Clarity</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1 (n=104)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td>4.10 (0.52)</td>
<td>0.82</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td>Clarity</td>
<td>3.27 (0.70)</td>
<td>0.88</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Repair</td>
<td>3.59 (0.90)</td>
<td>0.85</td>
<td>0.13</td>
<td>0.52***</td>
<td>1.00</td>
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<tr>
<td>Study 2 (n=60)</td>
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<td></td>
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<td></td>
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<tr>
<td>Attention</td>
<td>3.85 (0.39)</td>
<td>0.71</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarity</td>
<td>3.66 (0.59)</td>
<td>0.86</td>
<td>0.01</td>
<td>1.00</td>
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<tr>
<td>Repair</td>
<td>3.74 (0.56)</td>
<td>0.64</td>
<td>-0.24</td>
<td>0.30*</td>
<td>1.00</td>
</tr>
<tr>
<td>Study 3 (n=48)</td>
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<td></td>
</tr>
<tr>
<td>Attention</td>
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<td>0.88</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarity</td>
<td>3.28 (0.55)</td>
<td>0.74</td>
<td>0.08</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Repair</td>
<td>3.68 (0.94)</td>
<td>0.86</td>
<td>-0.04</td>
<td>0.22</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*p < 0.05; ***p < 0.001.
of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. Cronbach’s alpha was 0.86.

Physical Symptoms  Physical symptoms were measured using the 23-item somatic sub-scale of the Symptom Questionnaire (Kellner, 1987). Items from this questionnaire are brief, and involve yes/no responses. Cronbach’s alpha was 0.83.

Interpersonal Satisfaction Scale  Satisfaction with interpersonal functioning, was measured with a 7-item scale designed for this study. Items included “I am happy with my friendships” and “I have strong, secure family relationships.” Items were assessed along 10-point scales. Cronbach’s alpha for the scale was 0.67.

Results

Means and standard deviations for the TMMS subscales and intercorrelations among them are shown in Table I. Internal consistency for all three subscales was strong, with Cronbach’s alphas ranging from 0.82 to 0.85. Consistent with previous studies (Salovey et al., 1995), no significant correlations emerged between Attention and Clarity or Repair, but greater Clarity in distinguishing among moods was associated with greater skill at mood Repair (r (104) = 0.52, p < 0.001).

Pearson correlations between the TMMS subscales and the criterion scales are shown in Table II. Greater attention to mood was associated with greater empathy (r(104) = 0.44, p < 0.001), and perceptions of ability to distinguish among mood and skill at mood repair were associated with lower levels of symptom reporting, social anxiety, and depression (rs < −0.30 , ps < 0.01). Further, greater perceived skill at distinguishing between emotions (Clarity) and repairing mood (Repair) were associated with greater levels of satisfaction with interpersonal relationships (r(93) = 0.39 for Clarity; r(94) = 0.31 for Repair, ps < 0.01). All three TMMS subscales were positively associated with self-esteem (rs > 0.22, ps < 0.05).

Discussion

As in previous studies (e.g., Salovey et al., 1995), we found that clarity in distinguishing between moods and skill at mood repair were associated with lower levels of depression. Further, unlike Goldman et al. (1996), who found that under conditions of stress, perceived ability to attend to moods was related to greater symptom reports, in Study 1, skill at distinguishing between and repairing moods was linked with lower levels of symptom reporting. However, findings from Study 1 are based on participants

<table>
<thead>
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<th></th>
<th>Attention</th>
<th>Clarity</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empathy</td>
<td>0.44***</td>
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<td>0.11</td>
</tr>
<tr>
<td>Symptom reporting</td>
<td>−0.04</td>
<td>−0.30**</td>
<td>−0.35**</td>
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<tr>
<td>Social anxiety</td>
<td>0.11</td>
<td>−0.30**</td>
<td>−0.37**</td>
</tr>
<tr>
<td>CES-depression</td>
<td>0.00</td>
<td>−0.32**</td>
<td>−0.47***</td>
</tr>
<tr>
<td>Rosenberg self-esteem</td>
<td>0.22*</td>
<td>0.34***</td>
<td>0.65***</td>
</tr>
<tr>
<td>Interpersonal satisfaction</td>
<td>0.17</td>
<td>0.30***</td>
<td>0.31**</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01; ***p < 0.001.
reporting under non-stressed condition, whereas Goldman et al., found an interaction of attention with distress in predicting greater symptom reports. Perhaps attending to moods is associated with symptom reporting under conditions of stress, whereas under basal conditions, skills at distinguishing between and repairing moods are linked with less symptom reporting. Future research might examine associations between the aspects of PEI and symptom reporting under both stressed and non-stressed conditions. Finally, extending previous research with the TMMS, Clarity and Repair were correlated with lower social anxiety, and greater empathy and interpersonal satisfaction.

STUDY 2

Given these relations among PEI and measures of psychological, physical, and interpersonal functioning, in Study 2, we examined potential mechanisms underlying these associations. Specifically, we examined the relations between PEI, as measured by the TMMS subscales, and psychological and physiological responses to repeated laboratory stressors. Responses included salivary cortisol secretion, negative affect, state and trait coping, and perceptions of threat from stressors. We expected that greater PEI is associated with attenuated cortisol secretion in response to the repeated stressors, and greater habituation to the stressors over time. Further, we expected that greater PEI is related to adaptive coping and appraisal responses, including more active coping, less passive coping, and perceptions of stressors as less threatening.

Method

Participants

Sixty women, ages 30–45, recruited from a Northeastern urban community, participated in a study of stress and cortisol reactivity among women with central and peripheral body fat distribution (Epel et al., 2000). Participants were nonsmokers who reported no history of psychological or physical illness, or use of prescription medications that might affect the HPA axis. Participants abstained from caffeine for 4 h and from food and drink for 1 h before each laboratory session.

Procedure

At a baseline session, participants completed Trait Coping measures, followed by three 3-hour laboratory sessions on 3 consecutive days. Laboratory sessions were scheduled between 4:00 and 5:30 p.m. to control for diurnal variation in cortisol levels. Stress sessions consisted of a 30-minute baseline period during which subjects read neutral magazines, 15 min of filling out neutral questionnaires (including the TMMS), then 45 min of stress. All stress periods involved an anticipation period and an identical series of challenges, adapted from the Trier Social Stress Test (Kirschbaum et al., 1993). Challenges included visuospatial puzzles, serial subtraction, and a videotaped speech task. Tasks were made more stressful through the use of unrealistic time constraints. Eight salivary cortisol samples were collected during each stress session, including 2 baseline samples, 6 samples during stress, and 2 recovery samples 30 min
and 1 h after the completion of the stress period. Saliva samples were collected at matched time intervals throughout each session, at the following times: while resting (15 and 30 min), before stress (45 min), during stress (60 and 70 min), at the cessation of stress (90 min), and two recovery samples 30 and 60 min after stress (120 and 150 min).\(^1\) Self-reported mood was assessed before and after the stress periods on all three sessions (see Mood Reactivity below). State coping and threat perceptions were assessed following Session 1.

**Measures**

**Trait Meta-Mood Scale (TMMS)** Described in Study 1.

**Negative Mood Reactivity** Negative mood was assessed during baseline and immediately following the stress period for all 3 stress sessions using the Profile of Mood States (POMS; McNair et al., 1981). Residual gains were calculated as a measure of post-stress mood regressed on pre-stress mood. For a summary measure of increases in negative mood after exposure to the stressors, we took the mean across all 3 sessions of the negative mood residuals from the depression, anger, and anxiety subscales of the POMS.

**Trait Coping** Trait coping was assessed through a combination of two instruments, the COPE (Carver, et al., 1989), a multidimensional inventory designed to assess dispositional strategies for coping with stress, and portions of Stanton’s coping questionnaire (Stanton et al., 1994). The COPE consists of 60 items measured along 4-point scales with items assessing different strategies for coping with stress (e.g., seeking of emotional support, positive reinterpretation, acceptance, behavioral disengagement, denial). The 10 included items from Stanton’s measure assessed active coping through emotional approach (processing and expressing one's feelings). Following Tobin’s hierarchical model of coping strategies (Tobin et al., 1989), we created two global constructs: (a) approach or active coping (Cronbach’s alpha = 0.93) and (b) avoidant or passive coping (Cronbach’s alpha = 0.80). Active coping included strategies such as concentrating, planning, seeking instrumental and emotional support, and processing and expressing one’s emotions. Passive coping included disengagement strategies including denial, giving up, and using drugs, alcohol, eating, sleep, or movies to feel better or forget the problem.

**State Coping** State Coping was assessed immediately after participants completed the challenges on the first session. An adapted version of the COPE assessing strategies for coping with the specific laboratory challenges in this study was administered (Baggett et al., 1996). Sample items included, “I saw the math as challenging,” and “I acted as though you weren’t really serious about asking me to do the math.” Similar to

\(^1\)Peak cortisol response occurred at the cessation of stress (at 90 min), around 20 min after the speech stressor began, which was likely the most stressful of the tasks.
Trait Coping, State Coping was divided into two global constructs (a) active coping (Cronbach’s alpha = 0.71) and (b) passive coping (Cronbach’s alpha = 0.84).

Cognitive Appraisal  Cognitive Appraisal of the challenge was measured with items assessing the extent to which participants perceived each task as challenging or threatening. Items were rated along 4-point scales, and included two questions for each task (e.g., “I saw the math task as challenging” or “I saw the math task as threatening”). Participants rated the questions from 1 (not at all) to 4 (a lot). As ratings across the two items and across the math and puzzle tasks were highly intercorrelated, we created a composite challenge/threat appraisal scale across both tasks (Cronbach’s alpha = 0.70).

Salivary Cortisol  Saliva samples were collected using salivettes (Sarstedt, Rommelsdorf, Germany) that were frozen until lab analysis. Samples were assayed in duplicate by radioimmunoassay at the Yale Medical School General Clinical Research Center (GCRC) using a commercial kit (Diagnostic Products Corporation, Los Angeles, CA). Inter- and intra-assay coefficients of variation ranged from 4–5%. Cortisol area under the curve (AUC), a summary measure of total cortisol secreted, was calculated for each session. We also calculated mean AUC over the three stress sessions. Resting baseline cortisol was calculated as the mean of the 2 baseline measures on each stress day.

Results

Means, SDs, Cronbach’s alphas, and intercorrelations among the TMMS subscales are shown in Table I. Similar to Study 1, we found satisfactory internal consistency for all scales (Cronbach’s alphas ranged from 0.64 to 0.86). Again, Clarity in distinguishing among feelings was significantly correlated with skill at mood repair \( r(60) = 0.30, p < 0.05 \), but no significant associations between Attention and either Clarity or Repair emerged.

Next, Pearson correlations between the TMMS subscales and appraisal, mood reactivity, and state and trait coping were calculated. Greater skill at mood Repair was associated with perceptions of stressors as less threatening \( r(60) = -0.35, p < 0.01 \) and less trait and state passive coping \( r s (60) = -0.31 \) and \( -0.34, ps < 0.05 \). Greater Clarity in distinguishing among moods was associated with greater levels of negative mood following the stressor, controlling for baseline negative mood (mood reactivity) \( r(60) = 0.32, p < 0.05 \). Relationships among the other TMMS subscales and appraisal, coping, and mood reactivity were not significant.

Table III shows Pearson correlations among the TMMS subscales and baseline and total cortisol levels (AUCs) over the 3 stress sessions. Greater clarity in distinguishing between moods was associated with lower baseline cortisol levels on days 1 and 2 \( r s(60) = -0.28 \) and \(-0.30, respectively, ps < 0.05 \). Contrary to our predictions, skill at mood Repair was associated with greater cortisol at baseline on day 3 \( r(60) = 0.30, p < 0.05 \). Finally greater skill at distinguishing among moods (Clarity) was associated with lower cortisol secretion (AUC) during stress across all days, and particularly on day 2 \( r s(60) = -0.31 \) and \(-0.40, respectively, ps < 0.05 \). Perceiving one’s moods clearly, then, appears associated with lower adrenocortical activity during a laboratory stress protocol.
We also examined correlations between the TMMS subscales and degree of cortisol habituation to the repeated stress.\(^2\) Habituation was defined as (Day 1 AUC) – (Day 2 AUC) – (Day 3 AUC). Although there were no significant correlations between degree of habituation and Clarity and Repair (\(r = 0.19\) and \(-0.13\), respectively, \(p_s = ns\)), we found a significant positive correlation between degree of habituation and Attention (\(r(60) = 0.27, p < 0.05\)). Greater attention to moods was associated with greater habituation to repeated stressors.

Finally, we conducted a simultaneous multiple regression to examine the relation among the 3 TMMS subscales and Mean Cortisol AUC over the 3 days, controlling for the influence of baseline cortisol and overlap among the TMMS subscales. After controlling for basal cortisol, Repair, and Attention, we found a significant relationship between Clarity and average cortisol AUC (\(\beta = -0.35, t = 2.50, p < 0.05\)). Again, these findings suggest that even after having controlled for baseline cortisol levels, Clarity in distinguishing between moods is related to attenuated cortisol secretion across a laboratory stress protocol. However, as the regression model as a whole accounted for a nonsignificant 12\% of the variance in Mean Cortisol AUC (Model \(R^2 = 0.12, F(4, 54) = 1.80, p < 0.15\)), these findings should be interpreted with caution.

**Discussion**

As predicted, we found that greater PEI was associated with adaptive psychological coping, attenuated cortisol release following repeated stressors, and greater habituation to repeated stressors. In particular, skill at mood regulation (Repair) was related to perceptions of stressors as less threatening, and less use of state and trait passive coping strategies. Interestingly, Repair was also linked with greater baseline cortisol levels on the third day of repeated stress suggesting possible associations with repression.

Clarity, although associated with increased negative mood following stress, was also linked with lowered cortisol release at baseline, and throughout repeated stress sessions.

---

\(^2\)Overall, there were significant differences between Day 1 AUC and Day 2 AUC (\(t = 3.23, p < 0.01\)), but no significant differences between Day 1 and Day 3, and Day 2 and Day 3 AUCs.
Thus, although individuals who are able to distinguish their moods clearly may experience more negative mood following repeated stress, the increased negative mood does not translate into physiological arousal, which may reduce damage to physical systems and poor health outcomes (e.g., McEwen, 1998).

Finally, greater attention to moods was correlated with greater adrenocortical habituation to repeated stressors. Thus, unlike Attention’s association with an arguably maladaptive outcome (greater symptom perception) in Goldman et al. (1996), in Study 2, attention to mood was related to an adaptive physiological outcome (greater habituation to repeated stressors).

STUDY 3

In Study 3, we further examined links between PEI and psychophysiological measures of adaptive coping with stress. This study extended findings from Study 2 to cardiovascular (blood pressure) as well as HPA responses to stress, and to both men and women. As in Studies 1 and 2, we expected that greater PEI would correlate with more adaptive coping (more active strategies, less rumination), and, as in Study 2, with attenuated cortisol and blood pressure changes following laboratory stress.

Method

Participants

Forty-eight (21 male and 27 female) undergraduates (ages 17–23) recruited from Introductory Psychology classes and from signs around campus participated in a larger study of adrenocortical and blood pressure responses to interpersonal and achievement stress (Stroud et al., 1999). All participants reported that they were in good physical and mental health and did not use prescription medications. Participants abstained from eating or drinking (except water) for 2 h before the stress session, from exercise or alcohol for 24 h, and from caffeine for 12 h before the stress session.

Procedure

To allow physiological habituation to the laboratory, participants initially completed a 1.5-h rest session involving filling out a large packet of questionnaires. On a later day, participants were scheduled between 3:00 and 5:30 PM to complete a 2.5-h stress session. The stress session included baseline, stress, and recovery periods. During the baseline period, participants read neutral magazines for 10 min, then filled out questionnaires for 10 min. For the stress period, participants were randomly assigned to an achievement or interpersonal condition. The achievement condition lasted 45 min and involved challenging arithmetic problems using a hypothetical new numbering system (30 min), and memorization and recitation of a difficult passage (15 min). Time pressure was applied by the experimenter to increase participants’ distress. The interpersonal condition lasted 30 min and involved a rejection paradigm in which participants were asked to engage in two 15-min conversation segments (fun activities on weekends, friendships at Yale) while being excluded by 2 confederates (Stroud et al., 2000). Following the stressors, participants completed more questionnaires, including the TMMS, while listening to soft, classical music. Salivary cortisol and blood pressure measures were
collected at 6 time points throughout each stress session, including 2 baseline samples (one following the reading of magazines, and one following the 10-min questionnaire period), 2 samples during stress (one after each stressor), and 2 post-stress samples 15 and 30 min after termination of the stressors.

**Measures**

**Trait Meta-Mood Scale (TMMS)**  Described in Study 1.

**Salivary Cortisol**  As in Study 2, saliva samples were collected from each participant using the Salivette sampling device (Sarstedt, Rommelsdorf, Germany). Cortisol samples were again assayed by the General Clinical Research Center (GCRC) at Yale with inter- and intra-assay coefficients of variation ranging from 6 to 16%. Cortisol reactivity was calculated by subtracting peak cortisol levels from the mean of the 2 baseline measures. As cortisol values were positively skewed, analyses were based on logarithmic transformations of all cortisol values.

**Systolic and Diastolic Blood Pressure (SBP and DBP)** were measured with an Omron Auto-Inflation digital sphygmomanometer (Model HEM-706) at 6 time points during the stress sessions. The HEM-706 has passed accuracy standards of the Association of Medical Instrumentation, with mean differences between HEM-706 and stethoscopic readings ranging from 1.2 to 4.4 mm Hg (Foster et al., 1994). SBP and DBP reactivity scores were calculated by subtracting peak SBP or DBP from the mean of the 2 baseline SBP or DBP measures.

**Trait Coping**  Trait coping was assessed with the COPE (Carver et al., 1989), described in Study 2. Active and passive coping scales were formed. Internal consistency for the active scale was good (Cronbach’s alpha = 0.84); for the passive scale, internal consistency was low (Cronbach’s alpha = 0.41).

**Rumination**  Tendency to ruminate and engage in distraction in response to negative mood was measured using the Response Styles Questionnaire (Nolen-Hoeksema and Morrow, 1991). Participants were asked to indicate how they typically respond to depressed mood. The rumination scale included items such as “Think ‘Why do I always react this way?’,” and “Think, ‘I need to understand these feelings’.” Distraction was measured with items such as “Think, ‘I’ve got to get up and do something to make myself feel better’,” and “Think, ‘These feelings won’t last’.” Internal consistency for both scales was good (Cronbach’s alpha were 0.90 and 0.89, respectively).

**Results**

Means, SDs, Cronbach’s alphas, and intercorrelations among the TMMS subscales are shown in Table I. Means and SD’s were similar to those shown in Studies 1 and 2. Internal consistency was good for all scales (Cronbach’s alphas > 0.74) and similar to Studies 1 and 2. Intercorrelations followed the same pattern as those from Studies 1 and 2, with little relation between Attention and either Clarity or Repair, but a larger correlation between Clarity and Repair, which however was not significant in this study ($r(48) = 0.22$).
Pearson correlations between TMMS subscales and trait coping, rumination, and distraction, and salivary cortisol, SBP, and DBP reactivity are shown in Table IV. Skill at mood repair was associated with higher levels of active trait coping, higher levels of distraction following negative mood ($r_{s(48)} > 0.44$, $p<0.05$), and lower levels of rumination following negative mood ($r_{(48)} = -0.56$, $p<0.001$). No associations between the TMMS subscales and trait passive coping were found; however internal consistency for this scale was low. Finally, greater attention to moods was associated with attenuated cortisol and SBP reactivity to stress ($r_{s(48)} < 0.30$, $p<0.05$).

We then conducted a series of simultaneous multiple regression analyses to examine the relations among the 3 TMMS subscales and cortisol, and SBP reactivity, controlling for baseline levels and overlap between the TMMS subscales. Controlling for baseline levels as well as other TMMS subscales, greater attention to mood was associated with lower peak levels of cortisol ($\beta = -0.24$, $t = 2.10$, $p<0.05$) and SBP ($\beta = -0.23$, $t = 2.55$, $p<0.05$). Regression analyses accounted for 47% and 67% of the variance in peak physiologic responses, respectively. (For cortisol, Model $R^2 = 0.47$, $F(4, 43) = 9.53$, $p<0.0001$, and for SBP, $R^2 = 0.67$, $F(4, 43) = 21.93$, $p<0.0001$).

**Discussion**

As in Study 2, we found that skill at mood repair was associated with psychological changes reflecting adaptive coping with stress. Complementing the findings of Study 2, in which skill at mood Repair was related to lower levels of passive coping, in Study 3, Repair was correlated with greater levels of active coping. Skill at mood Repair was also associated with lower levels of rumination, a construct that has been linked to physiological reactivity and poor health outcomes (Pennebaker, 1995), and higher levels of distraction. With respect to physiological stress reactivity, Study 3 showed a relationship between PEI and attenuated cortisol as well as cardiovascular (SBP) responses to stress. In particular, increased attention to mood was related to more adaptive (lowered) physiological responses to acute stress.

**GENERAL DISCUSSION**

In three studies, we examined the relations between aspects of PEI, defined as the ability to attend to, distinguish among, and regulate moods, and a number of indices of adaptive coping. We extended previous research in which PEI was associated with both
health outcomes and psychological responses to laboratory stressors (Salovey et al., 1995; Goldman et al., 1996), to interpersonal functioning, coping styles, and physiological responses to stressors. Given links between both emotional functioning and physiological stress reactivity and health outcomes (McEwen, 1998), these studies lend preliminary support for psychophysiological stress reactivity as a potential mechanism linking emotional functioning with health.

Similar to previous studies, in Study 1, we found that aspects of PEI (specifically, the ability to distinguish between and repair moods) were related to lower levels of depression. Perceived ability to distinguish between and repair moods was also found to be related to lower levels of symptom reporting, a finding different from our previous work (Goldman et al., 1996), in which we found that perceived attention to mood was associated with greater levels of symptom reporting. However, Goldman et al.’s study described associations under conditions of stress, whereas the present study represented associations under non-stressed conditions. Extending previous studies, we also found that aspects of perceived emotional intelligence were also related to interpersonal functioning. Specifically, consistent with literature showing associations between emotional competence and interpersonal functioning (Cooper et al., 1998; Saarni, 1999), clarity in distinguishing among moods and skill at mood repair were associated with lower levels of social anxiety, and greater interpersonal satisfaction.

Across Studies 2 and 3, we found relationships between aspects of PEI and psychological and physiological measures of coping with acute and repeated laboratory stressors. Perceptions of skill at mood repair were associated with less state and trait passive coping (giving up, avoiding, or inhibiting active responses to stressful situations), greater trait active coping (active steps to change a stressful situation or ameliorate its effects), less use of rumination in response to negative mood, and perceptions of stressors as less threatening. However, although skill at mood repair was associated with arguably more adaptive coping strategies, it was also associated with greater use of distraction (participating in other activities to take one’s mind off one’s mood), which might be considered an avoidant coping strategy, and greater baseline cortisol levels on the third day of repeated stress. Heightened physiological responses, combined with avoidant coping might suggest an association between Repair and repression that might be further examined in future studies.

Clarity, or perceptions of ability to distinguish among moods, was associated with greater increases in negative mood following repeated stressors, but lowered cortisol release during baseline and repeated stress. Thus, although individuals who are able to distinguish their moods clearly may experience more negative mood following repeated stress, the increased negative mood does not translate into physiological arousal. Although preliminary, these findings suggest that willingness to distinguish negative feelings when stressed may play a role in reducing the damaging physiological consequences from stress and potentially reducing negative health outcomes. Results are consistent with studies by Pennebaker and colleagues in which individuals who disclosed emotions and details relating to a traumatic event evidenced greater negative mood immediately following the disclosure, but lower skin conductance levels, and better health outcomes in the long run (Pennebaker and Beall, 1986; Pennebaker, 1995). Results also extend those of Salovey et al. (1995), in which Clarity was associated with a greater decline in ruminative thought following an experimental stressor.

Attention to moods was associated with greater cortisol habituation to repeated stressors, and lowered cortisol and cardiovascular (systolic blood pressure) responses
to acute laboratory challenges. Thus, under differing circumstances, both attention to mood, and the ability to distinguish among moods may lead to lowered physiological responses to stress, which may eventuate in less damage to physiological systems and better health outcomes (e.g., McEwen, 1998). Interestingly, in a previous study, greater attention to mood was associated with greater symptom perception, but not reports of illness under increasing distress (Goldman et al., 1996), while attention was related to arguably positive consequences in the present study. Although future research is needed to look at more complex relationships between attention to moods, symptom perception, physiological responses to stress, and health, it is possible that attending more closely to moods may be linked with greater attention to physical symptoms; however, this does not appear to correlate with either health outcomes or physiological responses to stress. Last, we note that only skills at identifying and paying attention to moods were associated with physiological stress reactivity; perceived skill at mood repair was not. Perhaps if moods are not identified and attended to, physiological arousal results too quickly for repair to have an impact.

Limitations

Although suggestive, results from these studies should be interpreted cautiously. First, with respect to the validity of the emotional intelligence construct, the obvious limitation of these studies is their reliance on self-report measures. Emotional intelligence – as a set of competencies concerning the processing of emotion-relevant information – is likely to be measured with greatest validity when it is assessed as a set of competencies or skills (Mayer et al., 1999). Self-reported assessments in this domain may not be especially accurate or even available to conscious introspection. It is unlikely that test items such as “I think I’m a pretty smart person” would make for a valid measure of IQ; the usefulness of analogous questions about one’s emotional intelligence is also doubtful. What we have measured here should not really be considered emotional intelligence per se, but rather beliefs about emotional intelligence, a kind of emotional intelligence self-efficacy. Nonetheless, such self-reported appraisals have been important in other domains, and we expect that studies in which both task-based and self-report measures are included may reveal that both account for significant variance in important physiological, cognitive, and social outcomes.

Second, it is difficult to determine the direction of causality in these studies. For example, the relation between PEI and stress reactivity brings up the classic emotion–physiology debate. On one hand, as we have described thus far, Clarity in distinguishing among feelings and Attention to mood may predict lower physiological arousal in response to stress. On the other hand, it is possible that individuals with lower physiological arousal in response to stress are better able to attend to and identify their feelings, because physiological arousal is not impeding these processes. Likewise, individuals high in arousal may be unable to distinguish between and attend to mood as they are overwhelmed by the physiological arousal they experience. Future research to tease apart directional effects between PEI, stress reactivity, and health is warranted.

Third, in a small subset of participants in Study 3, we found significant correlations between the Repair subscale and a measure of social desirability. Although such associations were not examined for all participants in all studies, it appears that desire to be perceived favorably may influence responding to the Repair subscale of the TMMS. Future studies might further examine the influence of social desirability on participants’
perceptions of their ability to repair mood, and control for such effects in examining the influence of Repair on other outcomes.

Finally, although physiological habituation to repeated stressors has consistently been considered an adaptive response (and lack of habituation a maladaptive response), what constitutes an adaptive response to acute stress remains a question (Dientsbier, 1989; Ratliff-Crain and Vingerhoets, 1996; McEwen, 1998). In Study 3, we have described attenuated physiological responses to acute stress as adaptive; however, it is also possible that greater physiological responses to acute stress may be more adaptive, depending on the individual and the specific situation. Thus, it is possible that attention to moods is correlated with a less adaptive physiological response to stress. Future research to determine what constitutes adaptive and maladaptive acute stress responses may help to elucidate this issue.

CONCLUSIONS

Although there are some limitations to the studies presented here, PEI, in general, was related to a wide array of indices of adaptive psychophysiological responses across a variety of methodologies. These results suggest some relationship between perceived emotional competence and health that is deserving of further study. The importance of this relationship is further highlighted by the failure of many trait measures to predict physiological (particularly cortisol) reactivity to laboratory stressors in the past research (Kirschbaum et al., 1992; Van Eck et al., 1996). We advocate further examination of psychophysiological stress reactivity as a potential mechanism linking emotional intelligence with health, and believe such research will further the fields of emotions and health, as well as general psychobiology.

Acknowledgements

Preparation of this manuscript was facilitated by the following grants: American Cancer Society (RPG-93-028-05-PBP), National Cancer Institute (R01-CA68427), and National Institute of Mental Health (P01-MH/DA56826) as well as funding from the Ethel F. Donaghue Women’s Health Investigator Program at Yale University. We also thank the General Clinical Research Center at the Yale School of Medicine for carrying out the salivary cortisol analyses for Studies 2 and 3.

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