

Stress is in the eye of the beholder

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Abstract Despite a long history and a large volume of affective research, measuring affective states is still a non-trivial task that is complicated by numerous conceptual and methodological decisions that the researcher has to make. We suggest that inconsistent results reported in some areas of research can be partially explained by the choice of measurements that capture different manifestations of affective phenomena, or focus on different elements of affective processes. In the present study we examine one of such topics – a relationship between stress and individual’s work role. In a 2-week, multi-method in situ study we collected affective information from 40 subjects. All participants provided continuous physiological (cardiovascular) data for the entire duration of the study, submitted multiple daily self-reports of momentary affect, and filled out a one-time assessment of the global perceived stress. We found that individuals’ job role (specifically, decision-making workload) was not related to the cumulative measures of momentary affect, but was negatively correlated with the overall level of perceived stress. We further found that this negative relationship was partially mediated by individuals’ coping behaviors. Our results emphasize the important difference between fleeting and global (appraised) affective states, and remind about intervening variables that can significantly modify affective processes. We suggest directions for future research and discuss practical applications for stress management.

Keywords—*stress; coping; management.*

I. STRESS AT WORK

Over the years, clinical, health, personality and organizational psychologists have concentrated on understanding antecedents and consequences of stress at work. Managerial jobs and other positions that involve high-level decision-making have been in the focus of this research, as certain assumptions of these roles are traditionally associated with a heightened experience of stress. High stakes, taxing cognitive tasks, time constraints, managing other people, great demands on productivity – all create ever-increasing pressure, which can lead to stress [1-3].

However, as we detail later, recent studies begin to challenge this common perception, and show that decision-makers can, in fact, be *less* stressed than employees in other job roles [4; 5]. What brought such a conflicting view? The answer is in the focus on different elements of the stress model. Historically, literature has mostly concentrated on properties of the stressor (e.g., duration, intensity, amount) as the main determinants of its effects, e.g. [6]. For example, one famous discovery from this body of research is that the amount of stress and performance have the inverted-U-shaped

relationship, so that stress is enhancing to a certain point, after which it becomes debilitating [7]. From this point of view, it is only logical that job stress is directly determined by the number and nature of job stressors, and one’s resilience to stress. Because, indeed, the majority of decision-making roles involve a great deal of intensive and continuous stress.

As such, interest has started to shift from the stressor properties to intervening contextual and personality variables that determine the final impact of the stressful event. People vary greatly in how they evaluate, interpret and cope with stress, which means the same event may have quite different effects on audiences with different psychological resources [8]. For example, in his seminal work on job strain, Karasek [9] pointed out that mental stress at work results not only from job demands, but is also a function of the employee’s decision-making latitude. He argued that workers with a greater sense of control in their work roles may experience lower stress than individuals who do not have (or do not feel in) control at work. Several recent studies provided empirical support for this idea. Sherman and colleagues [5] discovered that individuals whose job involved managing other people experienced less stress than non-leaders. Researchers measured cortisol levels and self-reported anxiety in both groups, and discovered that managers had significantly lower levels of the stress hormone and lower scores on stress self-reports of anxiety than other participants. The authors attributed the difference to the fact that managers have a greater sense of control over their work environment, which can buffer anxiety (see also [10]).

Another known mediator of stress responses is an individual’s appraisal of the stressor. Consistent with the idea that cognitive interpretations have significant effects on emotions and performance (e.g., [11]), Blascovich and colleagues [12] argued that stress responses are shaped by an evaluation of situational demands and resources. If available resources are believed to be sufficient, a person sees the stressor as a mere challenge, but when demands exceed resources, the stressor can be seen as a threat. Building off that idea, Jamieson and colleagues [13] demonstrated that by re-appraising their physiological reactions, people can change their perception of the stressor and improve their performance. In their experiment, participants who were taught to see stress-induced arousal (i.e., a racing heart) as functional and adaptive, demonstrated better cardiovascular and cognitive results, relative to controls. Thus, researchers argued that it is not the stressful reaction itself that matters, but the individual’s construal of it. Someone who sees a stressor as threatening is likely to respond with a maladaptive response, whereas

someone who sees a stressor as a challenge is likely to be more resilient and respond in a more constructive manner.

Another team of researchers showed that such appraisals can be chronic, or trait-like [14]. Having a “stress-is-debilitating” mindset increases individuals’ motivation to avoid stress, and makes them more likely to ruminate about debilitating outcomes. On the other hand, a “stress-is-enhancing” mindset makes a person more likely to embrace stress, capitalize on its functional benefits (e.g., improved cognitive performance, productivity), and focus on adaptive coping behaviors. Which stress mindset a person holds could have a great impact on both physiological and behavioral outcomes.

II. THE PRESENT STUDY

Building on the new stress literature, we aim to re-examine the relationship between job role and stress. As detailed above, current evidence is mixed. On one hand, it is well established that a large cognitive workload in high-stakes environments depletes one’s psychological resources and can lead to stress. On the other hand, employees whose job role involves high-level decision-making, are also likely to possess characteristics that are known to be effective stress buffers: a sense of control over their work environment, and, possibly, a more adaptive stress mindset. We hope to contribute to this controversial body of research by providing additional empirical evidence using multiple methods and measuring various facets of stress.

The second objective of this study is to explore variables that may have a mediating effect on the stress response in work environments. It was noted that, although a sense of control and stress appraisal are important, they are not exclusive determinants of stress impact, and more research is needed on this topic [5; 14]. We suggest that stress coping is another variable that may be important in this context, and aim to test its effect in the present work. Coping refers to the process of treating, or dealing with, stress symptoms, and can involve cognitive, affective, and behavioral tactics [15]. Coping efforts can be healthy or unhealthy, and directed at either the problem itself, or at the stress-induced negative affect. Healthy and problem-focused coping tactics are generally associated with better long-term psychological outcomes [16].

A. Participants and Procedure

The study was conducted as a part of a larger project, HealthSense, where we are interested to examine factors that are associated with well-being in the workplace (n=40; 50% female). Participants were volunteers working in a research division of a large corporation, and represented different job roles: administrative support, engineering, and management. Participants were compensated with a \$250 gift card.

At the beginning of the study, participants filled out a survey with a number of demographic, personality and global stress measures. We then met with each participant individually to explain the study procedure, install the software, and instruct on how to use sensors. Participants were asked to be in the study for 10 full business days. During this time, physiological data was collected from a heart rate monitor worn around the chest and a FitBit. Participants were

asked to collect data throughout the day, and the logging ran continuously. In addition, we used experience sampling methodology to collect affective state throughout the day.

B. Measures

Job role Studies that explore stress associated with managerial and other high-stake decision-making roles often define participants as managers (or leaders, etc.) based on a single job descriptor – does one’s role involve managing other people? (e.g., [5]). This straightforward approach has practical benefits and is often valid. However, for more generalizable results, it is useful to consider a broader dimension descriptive of this job role. Karasek’s Job Content Questionnaire (JCQ) [9] provides such a tool. The JCQ was designed to measure various psychosocial aspects of the job, and includes several umbrella subscales that can be used independently: job security, social support, job demands, and decision latitude. The latter subscale includes two constructs – skill discretion and decision authority – and was used in the present study as a measure of the decision latitude (i.e., the decision-making load). In contrast to the traditional leadership-based definition, it allows us to generalize our findings to a broader range of jobs that also involve complex decision-making in high-stakes environments (e.g., neurosurgeons). The instrument is composed of 9 items that capture skill discretion (e.g., “My job requires a high level of skill”), and decision authority (e.g., “I have a lot to say about what happens on my job”), all measured on a 4-point scale.

Stress To measure stress, researchers traditionally rely on self-reports and physiological indicators [e.g., 17]. Detailed comparison of the two is beyond the scope of this paper, but their main differences need to be highlighted. First, physiological measures represent objective indicators of arousal, because they are universal, instantaneous, and are difficult (heart rate) or impossible (cortisol level) for an individual to control. Self-reports, on the other hand, represent a subjective evaluation, a product of cognitive reappraisal of the situation. Second, the two approaches differ in the average time frame of evaluation. Physiological measures detect a fluctuating momentary arousal, whereas the majority of traditional stress self-report instruments (e.g., PSS [18], PHQ9 [19]) normally probe into more global, accumulated stress as perceived and reappraised by the participant.

To account for these differences, we employed several measures of stress. First, in the pre-study survey participants completed the Perceived Stress Scale (PSS) – a well-validated instrument designed to measure the overall level of the stress as appraised by the person [17]. The scale consists of 14 items and includes questions such as “In the last month, how often have you felt nervous and “stressed”?” Second, we assessed stress via participants’ cardiovascular activity: heart rate (HR), and heart rate variability (HRV) – commonly used and well-validated indicators of stress. Physiological data was obtained from the heart rate monitor that all the participants were asked to wear at all times for the entire duration of the study. Heart

rate variability was measured via root mean square of successive differences (RMSSD) between beat-to-beat

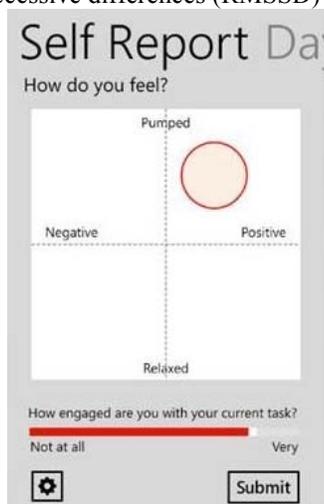


Fig. 1. Experience sampling probe

intervals [20]. Smaller values indicate greater stress. For all analyses, the raw values of the heart rate were used. Finally, we also collected participants' self-reports of momentary affective states. This was done through a small window that popped-up on the computer screen approximately 18 times each day. It presented participants with a 2x2 affect-arousal grid based on Russell's Circumplex model [21]. Valence, on the x-axis, ranges from negative (e.g., sad) to positive (e.g., happy), while arousal on the y-axis ranges from low (e.g., low energy) to high (e.g., high energy). The pop-up window prompted them to click with their cursor on the point on the 2x2 grid that best expressed their feeling "right now" (see Figure 1).

Coping Just like stress, coping is a broad construct that encompasses many behavioral, affective and cognitive processes. In the present study we used two different instruments that measured coping from different angles. The first is the inventory of coping strategies, i.e., various behaviors with which people respond to the feeling of stress [22]. The inventory of coping strategies was presented in the pre-study questionnaire, and included 11 healthy/adaptive (e.g., meditate, seek social support, focus on solving the problem) and 11 unhealthy/maladaptive (e.g., smoking, eating sugary foods, ignoring the problem) common stress coping tactics. Using a 5 point scale (1=never to 5=all the time), participants indicated how often they used each of the 22 tactics to manage stress. Scores for healthy/adaptive (i.e., "good") and unhealthy/maladaptive (i.e., "bad") tactics were summed up to compute corresponding scores for each individual. It is important to note that good and bad coping are orthogonal, so that individuals may score high on both measures, low on both measures, or high on one but low on another. Indeed, the two dimensions were unrelated in our study (Pearson's $r = -.15$, $p = .37$). The scores on these good and

bad coping inventories indicated individuals' chronic habits with regard to coping with stress.

TABLE 1. ESTIMATES OF EIGENVALUES ASSOCIATED WITH THE PRINCIPAL COMPONENTS OF THE COPING INVENTORY

Factor	Eigenvalue	% of Variance
1	2.60	32.46
2	1.78	22.21
3	.90	11.25
4	.75	9.36
5	.69	8.62
6	.59	7.31
7	.43	5.37
8	.28	3.46

For a more detailed analysis, it was decided to also explore the effect of specific coping strategies (rather than the broad healthy/unhealthy classes of behavior). To identify such strategies, we used the above-mentioned inventory of 22 stress-coping behaviors. First, we explored all the behaviors and removed those that were unpopular ($M \leq 2.00$; i.e., irrelevant behaviors that are never or almost never performed by our sample, such as drug use), or correlated with fewer than three other items (i.e., weakly related to any single factor). The remaining items were analyzed using a principal-component factor analysis with varimax rotation (Table 1.) We identified two clusters of coping behaviors (the top two factors with eigenvalues greater than 1.00). The first factor included 4 items (*Cronbach's* $\alpha = .73$), and tapped into the participant's focus on the source of the stressor (e.g., "I confront my source of stress and work to change it"). We labeled it "problem-solving coping strategy". The second cluster included behaviors aimed at improving one's stressed-induced affect, such as "I eat more than usual" (4 items, *Cronbach's* $\alpha = .66$). We labeled this strategy "emotion-management". The two factors should not be seen as opposite to each other, as usage of problem-solving tactics does not exclude mood repair work, and vice versa (cf. [23]). A person can actively engage in both types of coping, use only one of them, or use both sporadically. For further analysis, we computed participants' scores on both of these scale items, and used them as an additional measure for a more nuanced analysis of stress coping. Correlational analysis confirmed that the two dimensions were not just the opposite sides of the same coin, but were, indeed, unrelated: Pearson's $r = -.20$, $p = .21$. Thus, individual's stress coping was captured by four unrelated measures: scores on the maladaptive and adaptive coping inventories, and scores on the problem-solving and emotion-management coping scales.

III. RESULTS

Prior to analysis, daily median values of physiological and self-reported affect were averaged across all days to compute a single score on each of these measures for each participant. This approach is based on the idea that the overall, global affective state represents a cumulative effect of momentary states aggregated over time [24]. It was decided that median values are most representative of the person's typical daily stress, as they are most robust to the episodes of uncharacteristically high or low arousal.

Next, we measured Pearson's correlations between decision latitude score and other variables of interest: global perceived stress, averaged daily self-reported affect (arousal and valence), averaged daily physiological affect (HR and HRV/RMSSD), and scores on four coping measures (adaptive/maladaptive, and problem/emotion-oriented). Results are presented in Table 2. Overall, momentary measures of participants' affective states – both self-reported and physiological – were not related to the decision-latitude score: how people felt throughout the day, on average, did not depend on their job role. There was, however, a significant negative correlation with PSS, meaning that participants with greater decision-making responsibilities actually felt less

TABLE II. CORRELATION BETWEEN DECISION LATITUDE SCORES WITH AFFECT AND COPING MEASURES

	DLS
PSS	-.51*
Self-reported arousal	-.18
Self-reported valence	.32
Heart rate	-.27
RMSSD	.08
Maladaptive coping	-.36*
Adaptive coping	.30
Problem-oriented coping	.49**
Emotion-oriented coping	-.06

* $p < .05$ ** $p < .01$

stressed in general – likely an indicator of successful stress management. We also found that decision-making scores were negatively related to maladaptive coping and positively related to problem-oriented coping. To test whether these relationships explain (at least partially) the lower level of global stress in decision-makers, we next conducted mediation analyses using the bootstrapping method with bias-corrected confidence estimates [25]. The 95% confidence interval of the indirect effect was obtained with 1000 bootstrap samples.

Decision latitude scores were negatively associated with maladaptive coping ($\beta = -.14$, $t(38) = -2.37$, $p < .05$), which, in turn, was positively related to PSS ($\beta = .31$, $t(37) = 2.17$, $p < .05$). The effect of decision latitude score on PSS was partially mediated by maladaptive coping (indirect effect: $\beta = -.20$,

$t(38) = -3.62$, $p < .01$; direct effect $\beta = -.15$, $t(37) = -2.76$, $p < .01$; 95% CI = $-.121$ to $-.004$; Fig. 2).

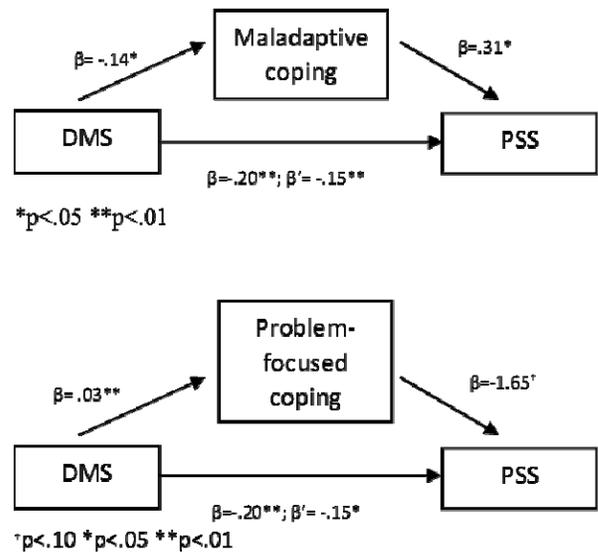


Fig. 2. Mediating effect of maladaptive and problem-solving coping habits on the relationship between decision-making scores (DMS) and PSS.

From the exploratory correlational analysis, we also saw that individuals' usage of problem-focused (but not emotion-repair) coping tactics was positively related to decision latitude scores. We conducted another mediation analysis to see whether this coping trait also contributed to lower level of global stress (Fig. 2). Decision latitude (decision-making) scores were positively associated with problem-focused coping ($\beta = .03$, $t(38) = 3.50$, $p < .001$), which, in turn, was negatively related to PSS ($\beta = -1.65$, $t(37) = -1.63$, $p < .10$). The effect of decision latitude scores on PSS was partially mediated by maladaptive coping (indirect effect: $\beta = -.20$, $t(38) = -3.62$, $p < .01$; direct effect $\beta = -.15$, $t(37) = -2.41$, $p < .05$; 95% CI = $-.271$ to $-.023$; Fig. 2).

IV. DISCUSSION

Our multi-method study provides evidence that individual's job role – more specifically, job decision latitude – is significantly associated with global (PSS), but not cumulative measure of fleeting affective states. When we considered physiological data and continuous daily self-reports, we found no indication that decision-makers are stressed more or less than other employees. However, the scores on PSS – a global cognitive measure of reappraised stress – were negatively related to the decision-making scores. This finding supports some recent reports showing that individuals in leadership positions are less stressed than non-leaders [5]. Our results provide some insight into the nature of job-stress relationship, and carry important implications.

First, stress researchers should be mindful about what tools they use to capture stress, as different manifestations of stress represent conceptually different phenomena. For example, the

REFERENCES

level of cortisol or heart rate are objective measures of momentary anxiety, but can be poor predictors of individual's subjective perception of the overall stress level. Similarly, objective measures of global stress (e.g., List of recent experiences, [26]) may not capture individual's perceived (reappraised) stress as reported in PSS or PHQ9. Conceptual and operational definitions of stress, as well as specific tools used to capture it, will greatly determine findings. The present study is a good illustration of this, and our mixed findings suggest that inconsistency of results reported in other works on job stress can be (at least partly) explained by methodological choices of the researchers.

Second, our results highlight the importance of various intervening variables that can play a significant role in the stress-outcome process. For example, we found that decision-makers whose jobs are traditionally perceived as stressful [2], actually perceived themselves less stressed in general, and that this re-appraisal was partially explained by their coping behavior. It is important to add that our results do not prove causality in these trends. Successful coping skills and lower global stress may both cause and result from one's job role. Individuals who are already effective at coping and/or less stressed (due to a variety of other factors) may be better equipped to compete on the job and, as a result, more likely to be selected into managerial positions. Alternatively, certain job roles may train one to become particularly effective at problem-solving and coping, which, in combination with greater sense of control and other circumstances, will confer great mental health despite multiple episodes of intensive stress at work.

Finally, our findings have implications for the general stress-management. The traditional view of stress is that of a debilitating factor that has to be eliminated, or, at least, reduced. Indeed, stress has been linked to a variety of negative health, work performance [27], and mental health outcomes [28; 29]. However, it is important to remember that stress can be also empowering (after all, it evolved as an adaptive mechanism [30-33]), and that it is not the stress itself, but reaction to stress, that really makes an impact. It is almost impossible to avoid or substantially reduce stress in our lives, but how one construes stressful events, and what one does with their consequences, is to a great degree under personal control and is a more realistic target for stress-management.

In our study, we found that one of the ways in which decision-makers reduced their accumulated daily stress was through successful coping. Interestingly, it was not the amount of adaptive coping, but the amount of maladaptive coping that mattered. In other words, it seems more important *not* to do unhealthy things than to do healthy ones. This is possibly due to additional physiological and psychological costs that maladaptive coping carries. Further, we found that individual's coping style – specifically, one's scores on problem-oriented, but not emotion-oriented, coping habits – was also predictive of the global stress level. We can only speculate, but it might be that funny cat videos and breathing exercises are only helpful inasmuch as they provide momentary emotional gratification, but they might not influence the general, baseline stress level. Future research will need to examine this directly.

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