

needed. A potential avenue includes computational linguistics that allows for nuanced evaluation of emotion based on verbal expression and analysis of text, content, tone, and pitch.

Conclusion

In conclusion, the field of health psychology can benefit from embracing Obama's call toward precision medicine where the intricacies of the link between emotion and health are more fully explored and where inconsistencies are delved into based on individual-level variation and the contextual environment. Indeed, this is a call to action to more fully embrace the definition of precision medicine put forth by the National Institutes of Health (NIH) as "an emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment, and lifestyle for each person" (NIH, 2015).

References

- Bild, D. E., Bluemke, D. A., Burke, G. L., Detrano, R., Diez Roux, A. V., Folsom, A. R., . . . Tracy, R. P. (2002). Multi-ethnic study of atherosclerosis: Objectives and design. *American Journal of Epidemiology*, 156(9), 871–881.
- Folkman, S. (1997). Positive psychological states and coping with severe stress. *Social Science & Medicine*, 45(8), 1207–1221.
- Friedman, G. D., Cutter, G. R., Donahue, R. P., Hughes, G. H., Hulley, S. B., Jacobs, D. R., Jr., . . . Savage, P. J. (1988). CARDIA: Study design, recruitment, and some characteristics of the examined subjects. *Journal of Clinical Epidemiology*, 41(11), 1105–1116.
- Hoffman, L. (2015). *Longitudinal analysis: Modeling within-person fluctuation and change*. New York, NY: Routledge.
- Jamieson, J., Hagen, E., Lee, H., & Yeager, D. (2018). Capitalizing on appraisal processes to improve affective responses to social stress. *EMR*, 10(1), 30–39.
- Kruse, E., & Sweeny, K. (2018). Comment: Well-being can improve health by shaping stress appraisals. *EMR*, 10(1), 63–65.
- Larsen, J. (2018). Comment: Homing in on a balanced psychology. *Emotion Review*, EMR, 10(1), 61–63.
- Lazarus, R., & Folkman, S. (1984). *Stress, coping and appraisal*. New York, NY: Springer.
- National Institutes of Health (NIH). (2015). *National Institutes of Health: All of Us Research Program*. Retrieved from <https://allofus.nih.gov/>
- Scherer, K. (2018). Comment: Comorbidity between mental and somatic pathologies: Deficits in emotional competence as health risk factors. *Emotion Review*, EMR, 10(1), 55–57.
- Sears, S. R., Stanton, A. L., & Danoff-Burg, S. (2003). The yellow brick road and the emerald city: Benefit finding, positive reappraisal coping and posttraumatic growth in women with early-stage breast cancer. *Health Psychology*, 22(5), 487–497.
- Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, 4, 1–32.
- Sorlie, P. D., Aviles-Santa, L. M., Wassertheil-Smoller, S., Kaplan, R. C., Daviglus, M. L., Giachello, A. L., . . . Heiss, G. (2010). Design and implementation of the Hispanic Community Health Study/Study of Latinos. *Annals of Epidemiology*, 20(8), 629–641. doi:10.1016/j.annepidem.2010.03.015

Author Reply: Arousal Reappraisal as an Affect Regulation Strategy

Jeremy P. Jamieson

Department of Psychology, University of Rochester, USA

Emily J. Hangen

Department of Psychology, University of Rochester, USA

Hae Yeon Lee

Department of Psychology, University of Texas, Austin, USA

David S. Yeager

Department of Psychology, University of Texas, Austin, USA

Abstract

The biopsychosocial (BPS) model of challenge and threat posits that resource and demand appraisals interact in situations of acute stress to determine affective responses, and concomitant physiological responses, motivation, and decisions/behaviors. Regulatory approaches that alter appraisals to regulate challenge and threat affective states have the

potential to facilitate coping. This reply clarifies the conceptualization of one such regulatory approach, arousal (or stress) reappraisal, and suggests avenues for future research. However, it is important to note that arousal reappraisal (or any brief psychological intervention) is not a "silver bullet" for improving stress outcomes, nor should this strategy be expected to positively impact all individuals. More work is needed to better elucidate how psychological and biological stress processes interact to shape health.

Author note: The authors' work on this review was supported in part by grants from the National Institute of Child and Human Development (HD084772) and the U.S. Department of Education, Institute of Education Sciences (R305A150036).

Corresponding author: Jeremy Jamieson, Department of Psychology, University of Rochester, 437 Meliora Hall, Rochester, NY 14627, USA. Email: jeremy.jamieson@rochester.edu

Keywords

biopsychosocial, emotion regulation, reappraisal

Acute stress situations require instrumental responding to address situational demands. In these stressful situations, the biopsychosocial (BPS) model of challenge and threat (see Blascovich, 2008, for a review) posits that resource and demand appraisals interact to determine affective responses, and concomitant physiological responses, motivation, and decisions/behaviors (see Jamieson, Hangen, Lee, & Yeager, 2018). Notably for research on emotion, challenge and threat are conceptualized as affective states. Regulatory approaches that seek to alter appraisals to regulate these affective states have the potential to facilitate active coping. This reply clarifies conceptualization of one such regulatory approach, arousal (or stress) reappraisal, and suggests avenues for future research.

Arousal Reappraisal as Affect Regulation

The primary aims of the arousal reappraisal strategy are to facilitate performance and promote active coping under stress. Thus, one might question whether arousal reappraisal fits the classic definition of affect regulation because of the limited focus on *subjective* affective experiences (see Tamir, 2018). However, the downstream effects of arousal reappraisal would not be possible without modifying subjective affective processes. To illustrate, the focal mechanisms of arousal reappraisal are stress appraisals, which reflect subjective perceptions of coping resources and situational demands. By shifting appraisals, arousal reappraisal regulates affective responses, and subsequently, can help improve physiological responses and performance. Moreover, research indicates that arousal reappraisal directly impacts subjective reports of anxiety (Jamieson, Peters, Greenwood, & Altose, 2016), affective displays of anxiety and shame (Beltzer, Nock, Peters, & Jamieson, 2014), and attention for emotionally negative cues (Jamieson, Nock, & Mendes, 2013). Thus, we argue that arousal reappraisal conforms to standard definitions of affect regulation, and thus has the potential to inform and be informed by the broader emotion regulation literature.

Addressing the limited focus on subjective outcomes in the extant arousal reappraisal literature, though, is important because understanding the interplay between subjective and objective processes has the potential to inform development of research in this area. However, we caution against overinterpreting subjective reports in stress research because evidence from the embodiment literature suggests information from the body need not be conscious to be able to impact emotional experiences and downstream outcomes (Blascovich & Mendes, 2010).

Given that arousal reappraisal manipulations directly state that stress can be functional and help improve performance (e.g., Jamieson, Nock, & Mendes, 2012; Jamieson et al., 2016; John-Henderson, Rheinschmidt, & Mendoza-Denton, 2015), one might also question whether placebo or self-fulfilling prophecy processes may be driving mechanisms of effects (e.g., Tamir,

2018). We believe this alternative is unlikely because arousal reappraisal has been tested against a face-valid placebo control that advocated ignoring stress so as to remain calm (Jamieson et al., 2012; Jamieson et al., 2016)—pilot testing revealed that the “ignore” placebo and arousal reappraisal materials were rated as similarly effective (Jamieson et al., 2012; see also Brooks, 2014). However, the contributions of positive expectations have not been quantified in research on reappraising stress arousal. An interesting line of future inquiry may seek to disentangle self-fulfilling prophecy and reappraisal processes.

Moderation and Future Directions

Initial research on arousal reappraisal has yielded promising findings, but moderators remain by and large unknown. In what follows we seek to highlight some potentially interesting avenues for future research along these lines.

Interoceptive ability—acuity for perceiving internal visceral states (Katkin, Blascovich, & Goldband, 1981)—predicts intensity of emotional experiences (Barrett, Quigley, Bliss-Moreau, & Aronson, 2004). Thus, effects of affect regulation on subjective experiences may manifest more readily when interoceptive ability is relatively high. However, it is unclear whether individuals with high interoceptive ability would benefit more or less from reappraisal manipulations. For instance, more accurate interoceptors may exhibit greater improvements because of their ability to better perceive arousal (Werner, Duschek, Mattern, & Schandry, 2009). Conversely, lay beliefs suggest that “stress is bad,” so good interoceptors may exhibit more rigid, dysfunctional appraisal patterns and be less inclined to “believe” reappraisal messages.

The idea that affective experiences operate in cycles across time and between people opens up possibilities that regulating affect at one time and place can feed-forward to impact the self and others in future situations (see Gross, 2015, for a review). Appraisals may be one type of mechanism through which affective dynamics effects unfold. For instance, if reappraising stress arousal improves wellbeing, this could feed-forward to improve health by shaping subsequent engagement and coping with similar future stressful situations (Kruse & Sweeny, 2018). That is, potential long(er)-term effects of arousal reappraisal on health may be communicated through wellbeing. However, additional work is needed to elucidate direct effects of arousal reappraisal on wellbeing, and to demonstrate how stress appraisals might shape and be shaped by wellbeing processes *in vivo*.

Affect regulation methods like arousal reappraisal are most effective in acute stress situations that include outcome uncertainty. If outcomes are known and certain, then there is no reason for individuals to engage. However, outcomes in the motivated-performance situations are rarely, if ever, certain. Even when the probability is very low that active coping efforts will yield positive outcomes—such as losing by 25 points in the third quarter of the Super Bowl—some outcome uncertainty remains. An uncertain outcome leaves open possibilities for adaptive coping to facilitate performance and promote positive

outcomes, such as players remaining challenged to overcome the deficit and win the game. Interesting avenues for future research would be to more closely examine the role(s) of contextual moderators, such as outcome uncertainty, when examining effects of stress appraisals.

Conclusion

There is much potential for affect regulation approaches, such as arousal reappraisal, to improve active coping in motivated-performance situations. Given that adaptive stress responses can facilitate coping with future stressors (Dienstbier, 1989), health education might seek to incorporate information about the multifaceted nature and functionality of stress. However, it is important to note that arousal reappraisal (or any other brief social psychological intervention) is not a “silver bullet” for improving outcomes in all stressful situations, nor should this strategy be expected to positively impact all individuals. Substantially more work is needed to better understand how psychological and biological stress processes interact to shape health outcomes.

References

- Barrett, L. F., Quigley, K. S., Bliss-Moreau, E., & Aronson, K. R. (2004). Interoceptive sensitivity and self-reports of emotional experience. *Journal of Personality and Social Psychology*, 87(5), 684–697.
- Beltzer, M. L., Nock, M. K., Peters, B. J., & Jamieson, J. P. (2014). Rethinking butterflies: The affective, physiological, and performance effects of reappraising arousal during social evaluation. *Emotion*, 14, 761–768.
- Blascovich, J. (2008). Challenge and threat. In A. J. Elliot (Ed.), *Handbook of approach and avoidance motivation* (pp. 431–445). New York, NY: Psychology Press.
- Blascovich, J., & Mendes, W. B. (2010). Social psychophysiology and embodiment. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., pp. 194–227). New York, NY: Wiley.
- Brooks, A. W. (2014). Get excited: Reappraising pre-performance anxiety as excitement. *Journal of Experimental Psychology: General*, 143, 1144–1158.
- Dienstbier, R. A. (1989). Arousal and physiological toughness: Implications for mental and physical health. *Psychological Review*, 96(1), 84–100.
- Gross, J. J. (2015). The extended process model of emotion regulation: Elaborations, applications, and future directions. *Psychological Inquiry*, 26(1), 130–137.
- Jamieson, J. P., Hangen, E., Lee, H., & Yeager, D. (2018). Capitalizing on appraisal processes to improve affective responses to social stress. *EMR*, 10(1), 30–39.
- Jamieson, J. P., Nock, M. K., & Mendes, W. B. (2012). Mind over matter: Reappraising arousal improves cardiovascular and cognitive responses to stress. *Journal of Experimental Psychology: General*, 141, 417–422.
- Jamieson, J. P., Nock, M. K., & Mendes, W. B. (2013). Changing the conceptualization of stress in social anxiety disorder: Affective and physiological consequences. *Clinical Psychological Science*, 1, 363–374.
- Jamieson, J. P., Peters, B. J., Greenwood, E. J., & Altose, A. J. (2016). Reappraising stress arousal improves performance and reduces evaluation anxiety in classroom exam situations. *Social Psychological and Personality Science*, 7(6), 579–587.
- John-Henderson, N. A., Rheinschmidt, M. L., & Mendoza-Denton, R. (2015). Cytokine responses and math performance: The role of stereotype threat and anxiety reappraisals. *Journal of Experimental Social Psychology*, 56, 203–206.
- Katkin, E. S., Blascovich, J., & Goldband, S. (1981). Empirical assessment of visceral self-perception: Individual and sex differences in the acquisition of heartbeat discrimination. *Journal of Personality and Social Psychology*, 40(6), 1095–1101.
- Kruse, E., & Sweeny, K. (2018). Comment: Well-being can improve health by shaping stress appraisals. *EMR*, 10(1), 63–65.
- Tamir, M. (2018). Commentary on Jamieson, Hangen, Lee, and Yeager: What should we regulate to promote adaptive functioning and how? *EMR*, 10(1), 65–67.
- Werner, N. S., Duschek, S., Mattern, M., & Schandry, R. (2009). Interoceptive sensitivity modulates anxiety during public speaking. *Journal of Psychophysiology*, 23(2), 85–94.

New Ways to Explore the Relationship–Emotion–Health Connection

David A. Sbarra

Department of Psychology, University of Arizona, USA

James A. Coan

Department of Psychology, University of Virginia, USA

Abstract

The commentaries by Rimé (2018) and Scherer (2018) underscore and extend many of the central themes discussed in our target article (Sbarra & Coan, 2018). This response filters the commentaries through the lens of

our review article and highlights the core idea that relationships provide a vital context for the types of emotional responding outlined in the commentaries, including the social sharing of emotion (an inherently interpersonal process) as well as the link between emotional competence and physical health (which can unfold both within and between people).