Journal of Innovations in Internal Medicine

Vol. 1 (2025)

SciFormat Publishing

Publisher:
SciFormat Publishing Inc.

ISNI: 0000 0005 1449 8214
2734 17 Avenue Southwest,
Calgary, Alberta, Canada,
T3E0A7

+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	NEUROPHYSIOLOGICAL MECHANISM OF STRESS AND ACTIVATION OF COGNITIVE RESOURCES TO OVERCOME STUDENT STRESS THROUGH RATIONAL-EMOTIVE BEHAVIORAL THERAPY
ARTICLE INFO	Maia Advadze, Giorgi Donadze, Nino Elisabedashvili, Natia Badridze, Teona Gubianuri (2025) Neurophysiological Mechanism of Stress and Activation of Cognitive Resources to Overcome Student Stress Through Rational-Emotive Behavioral Therapy. *Journal of Innovations in Internal Medicine*. Vol.1. doi: 10.69635/jiim.2025.9
DOI	https://doi.org/10.69635/jiim.2025.9
RECEIVED	13 November 2024
ACCEPTED	24 January 2025
PUBLISHED	01 February 2025
LICENSE	The article is licensed under a **Creative Commons Attribution 4.0 International License.**

NEUROPHYSIOLOGICAL MECHANISM OF STRESS AND ACTIVATION OF COGNITIVE RESOURCES TO OVERCOME STUDENT STRESS THROUGH RATIONAL-EMOTIVE BEHAVIORAL THERAPY

Maia Advadze
Ph.D., Dean of the Faculty of Medicine, Georgian National University SEU, Tbilisi, Georgia

Giorgi Donadze
Head of the Master's Program in Clinical Psychology, Faculty of Social Sciences, affiliated Associate Professor, Georgian National University SEU, Tbilisi, Georgia

Nino Elisabedashvili
Ph.D., Vice Rector, Georgian National University SEU, Tbilisi, Georgia

Natia Badridze
MD, Invited lecturer, Georgian National University SEU, Tbilisi, Georgia

Teona Gubianuri
Faculty of Social Sciences, affiliated Associate Professor, Georgian National University SEU, Tbilisi, Georgia

ABSTRACT

The research investigates the connection between irrational beliefs, cognitive resources, and the neurophysiological mechanisms of stress in students, particularly in relation to overcoming stress through Rational-Emotive Behavioral Therapy (REBT). Despite the prevalence of psychoprotective programs, the effectiveness of stress management remains limited, especially in light of evolving stress factors in modern society. Stress coping resources, including cognitive, emotional, and behavioral strategies, are integral to resilience, but irrational beliefs hinder effective stress management. The study hypothesizes that irrational beliefs influence brain neurophysiology and cognitive resource dynamics. Using psychodiagnostic assessments and physiological measurements, the study examined students' anxiety, stress markers (such as cortisol, TSH, and vitamin D), and irrational beliefs. While the results indicated no significant changes in the neurophysiological measures or anxiety levels after REBT intervention, there was a moderate positive correlation between pre- and post-measurements of stress variables. Despite these findings, irrational beliefs were not directly correlated with situational anxiety, personal anxiety, TSH, vitamin D, or cortisol levels. The study concludes that while REBT activates cognitive resources and may reduce irrational beliefs, other unexamined factors likely contribute to stress variability. Future research with larger sample sizes and additional variables is recommended to further explore the relationship between stress mechanisms and coping strategies.

KEYWORDS

Stress Management, Cognitive Resources, Irrational Beliefs, Rational-Emotive Behavioral Therapy, Neurophysiology, Stress Adaptation, Coping Strategies

CITATION

Maia Advadze, Giorgi Donadze, Nino Elisabedashvili, Natia Badridze, Teona Gubianuri (2025) Neurophysiological Mechanism of Stress and Activation of Cognitive Resources to Overcome Student Stress Through Rational-Emotive Behavioral Therapy. *Journal of Innovations in Internal Medicine.* Vol.1. doi: 10.69635/jiim.2025.9

Introduction.

The issue of stress management has become an increasingly prominent topic in psychological research, particularly among students, who often experience heightened levels of stress due to the academic, social, and personal pressures they face. Stress is a complex, multifaceted phenomenon that can significantly influence an individual's cognitive performance, emotional regulation, and overall mental health. As a result, effective methods of coping with stress are essential to help individuals maintain psychological resilience and optimize their ability to function in challenging situations. While various coping strategies have been developed over the years, the increasing frequency of stress-related problems and the complexity of modern-day stressors necessitate an ongoing reassessment of these methods.

At the core of stress management is the concept of stress coping resources, which refer to an individual's cognitive, emotional, and behavioral abilities that determine their psychological stability in stressful situations. These resources can vary widely depending on the individual's personality traits, coping strategies, life experiences, and the biological and neurophysiological factors that shape their responses to stress. The ability to adapt to stress is influenced by several factors, including the capacity to predict life situations, self-regulation skills, resilience to stress (emotional, behavioral, and physical), and the ability to transform stressful situations into manageable ones. Importantly, stress coping resources are not static but can evolve over time, influenced by an individual's life experiences and psychological development. However, despite the apparent importance of these resources in overcoming stress, the practical effectiveness of psychoprotective and psycho-corrective programs designed to teach stress management techniques remains limited.

This study addresses the need for a more comprehensive understanding of stress and its management, particularly in the context of students' educational activities. Students are often exposed to high levels of stress due to academic demands, social expectations, and personal challenges. These pressures, combined with the shifting nature of modern society, create an urgent need for adaptive stress management strategies. One such approach involves focusing on the cognitive resources that individuals possess, which can be activated to overcome stress. These cognitive resources encompass the intellectual abilities to perceive, process, and interpret information, as well as the emotional and behavioral strategies used to manage stress. One of the central components of cognitive resources is the belief system, particularly the distinction between rational and irrational beliefs.

Irrational beliefs, as defined by Rational-Emotive Behavioral Therapy (REBT), are rigid, illogical, and often self-defeating thoughts that can exacerbate stress responses. Such beliefs can interfere with an individual's ability to perceive and process stressful situations in a balanced and adaptive manner. REBT, a therapeutic approach developed by Albert Ellis, posits that irrational beliefs significantly contribute to emotional distress and maladaptive behavior. By challenging and reframing these irrational beliefs, individuals can develop more rational, evidence-based beliefs, which in turn can activate cognitive resources and enhance stress resilience. According to REBT, individuals with rational beliefs are better equipped to cope with stress, as these beliefs are grounded in logic, flexibility, and a recognition of the desirability of certain outcomes. Conversely, individuals with irrational beliefs often experience heightened anxiety, emotional dysregulation, and maladaptive behavior, which hinder their ability to manage stress effectively.

This study hypothesizes that the nature of an individual's beliefs—whether rational or irrational—can influence their neurophysiological responses to stress, including the activation of brain regions and the production of stress-related hormones such as cortisol. The neurophysiological mechanisms underlying stress involve a complex interplay between neurotransmitters, hormones, and brain structures that regulate emotional and cognitive functions. For example, neurotransmitters such as glutamic acid and gamma-aminobutyric acid (GABA) play key roles in regulating neural activity and emotional stability. A balance between these neurotransmitters is essential for maintaining a calm and adaptive response to stress. Additionally, stress-related hormones like cortisol can significantly impact brain functioning and emotional regulation, particularly when levels remain elevated over extended periods. Prolonged stress can lead to a dysregulation of the stress response system, contributing to chronic anxiety, depression, and cognitive impairments.

Research has shown that cognitive processes and neurophysiological mechanisms are deeply interconnected. When an individual perceives a stressful situation, the brain processes the information and triggers emotional and physiological responses. In situations where irrational beliefs dominate, these responses can become exaggerated and maladaptive, leading to heightened stress. The amygdala, a brain region involved in processing emotions, plays a central role in this process. When irrational thoughts trigger fear and anxiety, the amygdala becomes overactive, which can lead to a cascade of physiological responses such as increased heart rate, elevated cortisol levels, and

impaired cognitive functioning. By contrast, rational thinking, which is facilitated by cognitive resources, can help regulate the amygdala's response and prevent the escalation of stress.

The neurophysiological mechanisms involved in stress regulation are influenced not only by cognitive factors but also by other biological factors such as vitamin D levels, thyroid function, and cortisol production. These factors can significantly impact an individual's ability to cope with stress. For example, vitamin D is known to play a role in regulating mood and reducing anxiety, while an imbalance in thyroid-stimulating hormone (TSH) levels can affect overall energy levels and stress responses. Cortisol, often referred to as the "stress hormone," is produced in response to stress, and its prolonged elevation can impair cognitive performance and emotional regulation. The ability to maintain a balanced neurophysiological state, therefore, is crucial for optimal stress management.

The main objective of this study is to examine the relationship between irrational beliefs, cognitive resources, and the neurophysiological mechanisms of stress in students. Specifically, the study aims to identify how irrational beliefs influence the activation of cognitive resources and the neurophysiological responses to stress. By focusing on students, this research will provide valuable insights into how cognitive and neurophysiological factors interact in the context of academic stress. Furthermore, it aims to explore the potential of REBT as a tool for activating cognitive resources and improving stress resilience among students. The study will also contribute to a better understanding of the role of neurophysiological markers such as cortisol, vitamin D, and TSH in the stress response and how these factors relate to an individual's cognitive processes.

In sum, this research seeks to bridge the gap between cognitive, emotional, and neurophysiological perspectives on stress, offering a comprehensive model for understanding how students can overcome stress through the activation of cognitive resources. By focusing on the interaction between irrational beliefs, cognitive resources, and neurophysiological mechanisms, this study hopes to contribute to the development of more effective interventions for stress management in educational settings. Through the application of Rational-Emotive Behavioral Therapy, students can potentially transform their beliefs, enhance their cognitive resources, and improve their ability to cope with stress, ultimately leading to better academic performance and emotional well-being.

Materials and Methods.

Descriptive Statistics.

The study involved a total of 24 students. The minimum age of the participants was 18, the maximum was 42, and the average age of the participants was 22 years.

The participants were equally distributed by gender, with 12 female and 12 male participants. Prior to the clinical interviews, participants underwent psychodiagnostic assessments. In the situational anxiety variable, the majority of participants (N=18) showed moderate anxiety, while 6 participants exhibited high anxiety levels.

Similarly, in the personal anxiety variable, the majority of participants (N=14) exhibited moderate anxiety, while 10 participants showed high anxiety levels.

In the irrational beliefs variable, the maximum number of irrational beliefs recorded was 2, found in 7 participants.

The preliminary measurement of the "stress complex" showed that the majority of participants had a normal level of thyroid-stimulating hormone (TSH) (N=22), while 2 participants had high levels.

A low vitamin D level was found in all participants (N=24).

In the cortisol variable, the majority of participants showed normal levels (N=21), while 3 participants had high levels.

Results of Psychodiagnostic and Physiological Measurements Post-Clinical Interview:

In the situational anxiety variable, the majority of participants (N=15) showed low anxiety, 8 participants exhibited moderate anxiety, and 1 participant showed high anxiety.

In the personal anxiety variable, the majority of participants (N=20) exhibited moderate anxiety, 3 participants showed low anxiety, and 1 participant exhibited high anxiety.

In the irrational beliefs variable, the majority of participants (N=8) had no irrational beliefs, while 5 participants reported having two irrational beliefs.

Conclusion Statistics.

There was no significant difference between the pre- and post-measurements in the situational anxiety variable (mean=2.25; 1.42; st.d=.442; .584), indicating that the difference between the two measurements is small. A moderate positive correlation was found between the pre- and post-measurements, which was statistically significant.

Similarly, in the personal anxiety variable, no statistically significant correlation was found between the pre- and post-measurements (mean=2.42; 1.92; st.d=.504; .408).

There was a substantial difference in the means and standard deviations in the irrational beliefs variable (mean=4.46; 1.79; st.d=2.48; 1.69), indicating that there was considerable change between the two measurements, suggesting the measurement was not precise, though a moderate positive correlation was found, which was statistically significant.

The t-test revealed a statistically reliable relationship between pre- and post-measurements for the situational anxiety groups, with a medium strength (t=7.23; P<.05). There was also a statistically significant weak similarity between the pre- and post-measurements for personal anxiety (t=4.15; P<.05). For irrational beliefs, the t-test revealed a statistically significant low similarity (t=6.49; P=.05), but due to large differences in the means and standard deviations, this similarity cannot be considered reliable.

For the "stress complex," the t-test results for TSH showed almost identical means, with small differences in standard deviations (mean=2.08; 2.13; st.d=.28; .34). The correlation between the two measurements was not statistically significant. For vitamin D, the means showed a small difference, with a slight change in the standard deviation (mean=1; 1.33; st.d=.00; .702). The cortisol data showed similar results (mean=2.13; 2.21; st.d=.39; .46), and no statistically significant correlation was found between the two measurements.

The t-test for vitamin D revealed a statistically significant small difference between the pre- and post-measurements (t=-2.33; P<.05).

Multiple Regression Analysis.

The purpose of the study was to examine the relationship between irrational beliefs, cognitive resources, and neurophysiological mechanisms of stress in students' academic performance, particularly in relation to coping with stress.

The predictor variables were situational and personal anxiety, TSH, vitamin D, and cortisol levels, while the dependent variable was irrational beliefs.

The hypotheses were:

- H1: Irrational beliefs are associated with situational and personal anxiety.
- H2: Irrational beliefs are associated with TSH levels.
- H3: Irrational beliefs are associated with vitamin D levels.
- H4: Irrational beliefs are associated with cortisol levels.

A multiple regression analysis was conducted to identify which variables predict irrational beliefs. The results showed that the predictor variables—situational and personal anxiety, blood analysis results—explained a small amount of variance in the dependent variable (R^2=.356).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.597	.356	.220	.515

F (df regression=4 ; df residual = 19) = 2.624, with a mean value, but not statistically significant (P=0.067).

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.787	4	.697	2.624
	Residual	5.046	19	.266	
	Total	7.833	23		

Coefficients

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	
1	(Constant)	4.824	1.248	3.866
	POST_IRAC	.007	.065	.106
	POST_TSH_ULTRA	-1.962	.903	-2.174
	POST_VIT_D	1.145	.386	2.969
	POST_CORTISOL	-.352	.385	-.912

Analysis Conclusion:

The analysis revealed that irrational beliefs are not influenced by situational and personal anxiety, nor by TSH, vitamin D, and cortisol levels. These relationships were not statistically significant. Therefore, none of the hypotheses were confirmed:

- H1: Irrational beliefs are positively correlated with personal anxiety - rejected.
- H2: Irrational beliefs are positively correlated with situational anxiety - rejected.
- H3: Irrational beliefs are positively correlated with TSH levels - rejected.
- H4: Irrational beliefs are positively correlated with vitamin D levels - rejected.
- H5: Irrational beliefs are positively correlated with cortisol levels - rejected.

Based on the findings, despite irrational beliefs significantly affecting stress levels, there are other more influential factors determining the variability of stress levels.

Discussion.

The study presented an examination of the neurophysiological mechanisms of stress and how cognitive resources can be activated to help students overcome stress, particularly through the application of Rational-Emotive Behavioral Therapy (REBT). The study's findings offer insight into the relationship between irrational beliefs, stress levels, and the neurophysiological markers of stress such as cortisol, vitamin D, and thyroid-stimulating hormone (TSH) levels.

Relationship Between Irrational Beliefs and Anxiety.

The hypothesis that irrational beliefs would be associated with higher levels of situational and personal anxiety was not supported by the findings. Despite the initial expectation that irrational thinking would correlate with anxiety levels, the analysis did not reveal any statistically significant relationship between irrational beliefs and situational or personal anxiety. This suggests that irrational beliefs, although a key factor in stress management, may not directly influence the degree of anxiety experienced in various situations. This finding diverges from the theoretical underpinnings of REBT, where irrational beliefs are often seen as central to anxiety responses. One possible explanation is that individual experiences of anxiety are more complex than initially thought and may involve other cognitive or environmental factors not captured in the study's design. Moreover, situational and personal anxiety might be influenced by a broader range of factors, including coping styles, social support, and life stressors, rather than just the presence of irrational beliefs.

Neurophysiological Markers and Irrational Beliefs.

Similarly, the relationship between irrational beliefs and neurophysiological markers such as TSH, cortisol, and vitamin D levels was also not found to be statistically significant. Although existing literature suggests a connection between stress, cortisol, and cognitive function, the study did not confirm a direct link between irrational beliefs and these biomarkers. This might be due to the small sample size, which limits the statistical power to detect such associations. Additionally, it is important to recognize that the neurophysiological mechanisms of stress are highly dynamic and influenced by a range of physiological and psychological factors. For instance, while cortisol is a key marker of stress response, its levels can fluctuate based on time of day, environmental stressors, and individual physiological differences.

Moreover, vitamin D and TSH levels, both of which play roles in mood regulation and stress response, showed some variation across participants, but these markers did not significantly correlate with irrational beliefs. It is possible that these neurophysiological markers are influenced by chronic stress or broader health conditions that were not fully captured in the study.

Activation of Cognitive Resources Through REBT.

The study did, however, highlight the potential of REBT in reducing irrational beliefs and activating cognitive resources, which aligns with the central tenet of REBT. The significant reduction in irrational beliefs among the participants, even though the physiological and anxiety measures did not show large-scale changes, suggests that REBT can indeed help in reshaping cognitive patterns. By reframing irrational thoughts and beliefs, individuals may be able to activate cognitive resources that allow for better stress management. The REBT technique of "debating irrational beliefs" could explain how individuals move towards more rational thinking, which in turn can improve stress resilience and coping strategies.

While the physiological markers of stress did not show strong correlations with irrational beliefs, it is possible that the activation of cognitive resources helped participants navigate their stress in more adaptive ways. The process of changing irrational beliefs can lead to a shift in emotional and behavioral responses, fostering a more adaptive and balanced stress response.

Limitations and Future Directions.

Several limitations of the study must be acknowledged. First, the small sample size (N=24) and unequal age distribution may have limited the generalizability of the findings. Larger and more diverse samples could provide a clearer picture of the relationships between irrational beliefs, cognitive resources, and neurophysiological stress responses. Additionally, many participants did not complete the second round of measurements, which introduces potential bias in the data. The lack of longitudinal data also limits our understanding of how long-lasting the effects of REBT are in terms of stress reduction and the activation of cognitive resources.

Furthermore, other potential influencing factors such as academic workload, personal life stressors, and social support were not fully controlled for, which could have contributed to the variability in stress levels among participants. It would be beneficial for future studies to account for these external variables and measure their impact on the relationship between cognitive resources and stress.

Another consideration is the methodological approach used to measure the physiological markers. Although the study incorporated measurements of cortisol, vitamin D, and TSH, additional biomarkers or a more detailed examination of the autonomic nervous system could provide further insights into the neurophysiological mechanisms of stress. Furthermore, assessing the temporal changes in these markers before and after cognitive interventions like REBT could clarify the mechanisms through which cognitive changes lead to physiological stress reduction.

Conclusions.

The study aimed to investigate the relationship between irrational beliefs, cognitive resources, and neurophysiological mechanisms of stress in students, specifically in relation to stress management through Rational-Emotive Behavioral Therapy (REBT). Despite significant attention to the influence of irrational beliefs on stress, the findings indicate that the hypothesis linking irrational beliefs to situational and personal anxiety, thyroid-stimulating hormone (TSH), vitamin D, and cortisol levels was not substantiated by the data.

The results from multiple regression analysis showed that these physiological and psychological variables explained only a small portion of the variance in irrational beliefs, and the relationships between them were not statistically significant. This suggests that irrational beliefs are not directly influenced by these neurophysiological markers or anxiety levels, indicating that other factors may be more influential in determining stress levels in students.

The study also revealed that cognitive resources, particularly rational beliefs, are crucial for stress resilience. While the intervention showed some change in irrational beliefs and physiological measures (such as vitamin D levels), the lack of statistically significant relationships between irrational beliefs and other variables suggests that these factors alone do not account for variations in stress responses.

The limitations of the study, including the small sample size and the unequal distribution of ages, were acknowledged. The results are constrained by these limitations, and it is recommended that future research involve a larger, more balanced sample, consider additional variables, and explore external factors (e.g., exam periods, personal stressors) that might impact stress levels more effectively. Despite these constraints, the study contributes valuable insight into the complex dynamics between stress, cognitive resources, and neurophysiology, highlighting the need for a more comprehensive understanding of stress management in academic settings.

In conclusion, while the activation of cognitive resources through REBT is beneficial for reducing irrational beliefs, more research is needed to fully understand the neurophysiological mechanisms behind stress resilience and the broader factors that contribute to effective stress management among students.

REFERENCES

1. Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the Brief COPE. *International Journal of Behavioral Medicine, 4*(1), 92-100. https://doi.org/10.1207/s15327558ijbm0401_6
2. Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310-357. https://doi.org/10.1037/0033-2909.98.2.310
3. David, D. (2008). *Rational-emotive behavior therapy: A therapist's guide*. Springer.
4. Dryden, W., & David, D. (2008). Rational emotive behavior therapy: Current status and future directions. In M. W. Gallagher & L. A. Gorman (Eds.), *Cognitive-behavioral therapy: Research and practice* (pp. 150-171). Routledge.
5. Ellis, A. (1962). *Reason and emotion in psychotherapy*. Lyle Stuart.
6. Jones, F., & Schilling, R. (2008). Stress and coping: Theories and research. In C. L. Cooper (Ed.), *Handbook of stress: A guide to the current research and its applications* (pp. 141-157). Wiley-Blackwell.
7. Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing Company.
8. McEwen, B. S. (2006). Protective and damaging effects of stress mediators: Central role of the brain. *Psychosomatic Medicine, 68*(1), 3-8. https://doi.org/10.1097/01.psy.0000195797.48020.91
9. Phelps, E. A., & LeDoux, J. E. (2005). Contributions of the amygdala to emotion processing: From animal models to human behavior. *Neuron, 48*(2), 175-187. https://doi.org/10.1016/j.neuron.2005.09.025
10. Allen, A. P., Kennedy, P. J., Cryan, J. F., Dinan, T. G., & Clarke, G. (2014). Biological and psychological markers of stress in humans: Focus on the Trier Social Stress Test. *Neuroscience and Biobehavioral Reviews, 38*, 94–124. https://doi.org/10.1016/j.neubiorev.2013.11.004
11. Boals, A., & Banks, J. B. (2012). Effects of traumatic stress and perceived stress on everyday cognitive functioning. *Cognition and Emotion, 26*(7), 1335–1343. https://doi.org/10.1080/02699931.2011.651100
12. Chrousos, G. P. (2009). Stress and disorders of the stress system. *Nature Reviews Endocrinology, 5*, 374–381. https://doi.org/10.1038/nrendo.2009.106
13. Clements, A., & Bailey, B. (2010). The relationship between temperament and anxiety. *Journal of Health Psychology, 15*(4), 515–525. https://doi.org/10.1177/1359105309355340
14. Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *JAMA: The Journal of the American Medical Association, 298*(14), 1685–1687. https://doi.org/10.1001/jama.298.14.1685
15. David, D., Schnur, J., & Belloiu, A. (2002). Another search for the "hot" cognitions: Appraisal, irrational beliefs, attributions, and their relation to emotion. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 15*, 93–131. https://doi.org/10.1023/A:1019876601693
16. Dickerson, S. S., Gruenewald, T. L., & Kemeny, M. E. (2004). When the social self is threatened: Shame, physiology, and health. *Journal of Personality, 72*, 1191–1216. https://doi.org/10.1111/j.1467-6494.2004.00296.x
17. Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*, 355–391. https://doi.org/10.1037/0033-2909.130.3.355
18. Ellis, A. (1962). *Reason and emotion in psychotherapy.* Secaucus, NJ: Birch Lane.
19. Ellis, A. (1994). *Reason and emotion in psychotherapy (Rev. ed.)*. Secaucus, NJ: Birch Lane.
20. Fulton, J., Marcus, D., & Merkey. (2011). Irrational health beliefs and health anxiety. *Journal of Clinical Psychology, 67*(8), 527–538. https://doi.org/10.1002/jcip.20769
21. Khoo, B., Boshier, P. R., Freethy, A., Tharakan, G., Saeed, S., Hill, N., Williams, E. L.,
22. Moorthy, K., Tolley, N., Jiao, L. R., Spalding, D., Palazzo, F., Meeran, K., & Tan, T. (2017). Redefining the stress cortisol response to surgery. *Clinical Endocrinology, 87*(5), 451–458. https://doi.org/10.1111/cen.13462
23. McGregor, B. A., Murphy, K. M., Albano, D. L., & Ceballos, R. M. (2016). Stress, cortisol, and B lymphocytes: A novel approach to understanding academic stress and immune function. *Stress, 19*(2), 185–191. https://doi.org/10.3109/10253890.2016.1150897
24. Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: Psychological, behavioral, and biological determinants. *Annual Review of Clinical Psychology, 1*, 607–628. https://doi.org/10.1146/annurev.clinpsy.1.102803.144141