



The post-Cartesian dilemma: Reuniting the mind and body through psychoneuroimmunology

Jeanette M. Bennett^{*}

Department of Psychological Science, Health Psychology PhD Program, University of North Carolina at Charlotte, USA

ARTICLE INFO

Keywords:

Dualism
Adversity
Stress
Psychoneuroimmunology
Embodiment
Health
Resilience

ABSTRACT

While today, it might seem absurd to hear anyone claim that stress does not alter all aspects of the human experience, including behavioral, cognitive, affective, and physiological processes. Dr. Janice Kiecolt-Glaser started her career at a time when stress was primarily considered a neuroendocrine response with cardiovascular repercussions. She was part of a small group of innovative scientists who began to push the boundaries of stress research – many contemporary immunologists and virologist disputed their early results in 1980s and 90s – and, yet, they persevered by connecting psychological stress to altered immune function via stress-related neuroendocrine changes. As a clinical psychologist, she focused mainly on human research studies to advance the field of psychoneuroimmunology throughout her career. Her research demonstrates how adversity and psychosocial aspects of human experience alter physiological functioning, primarily immune, and health or, in other words, the embodiment of our lived experiences. This short review is a contextualized synthesis of Dr. Kiecolt-Glaser's key contributions to the fields of psychoneuroimmunology and health psychology and her influence on my present day thinking and research approaches, as well as potential steps forward in our post-pandemic world.

1. Cartesian dualism and the biomedical model

Great minds of centuries ago still influence our everyday lives as they have shaped the systems and cultural approaches of our lived experience. Western Euro-centric societies evolved from writings and education led by Renaissance philosophers. René Descartes altered the trajectory of medical science and the understanding of the whole human as a unified entity. Dualism, the philosophical split of the mind and body [1], enabled scientists to study the natural body and its inner functioning, while protecting the metacognitive, immaterial, mind for God and did not threaten the Church as a strong sociopolitical power.

Whether or not it was Descartes' intention, our biological, physical, and chemical understanding of how the body functioned flourished without much intervention from players outside of the scientific field, resulting in the biomedical model of illness [2]. The biomedical model used reductionist approaches to address significant health-related ailments, primarily those associated with organic changes or the presence of microbes and extended the quantity and quality of human life dramatically. Unfortunately, it also delayed our understanding of how the mind and environmental context affected health [3]. This lack of

seeing the whole human – (1) as the summation of complex adaptive physiological systems and (2) enveloped in an environmental context that is a product of complex adaptive sociopolitical and cultural systems with a history preceding their existence – has provided the bedrock for the current health crises and disparities.

2. Embodiment of stress

Stress research started in labs directed by physiologists and endocrinologists less than a century ago. While the physiological details of the neuroendocrine response to a stressor were being defined, it became clear that not all individuals responded to a stressor similarly. This observation opened the door for newly formed field of psychology to investigate when and how psychological, social, cognitive, and socio-economic factors altered the physiological processes and ultimately health [4].

Dr. Kiecolt-Glaser embraced the stress field and was a key scientist in advancing how psychological stress processes altered immune function, providing a direct link between stress and health [5,6]. While some of her psychoneuroimmunology peers were examining critical mechanistic

^{*} UNC Charlotte, Dept of Psychological Science, 9201 University City Blvd, Charlotte, NC, 28223, USA.

E-mail address: jbenne70@charlotte.edu.

<https://doi.org/10.1016/j.cpnec.2024.100265>

Received 15 May 2024; Received in revised form 22 September 2024; Accepted 24 September 2024

Available online 26 September 2024

2666-4976/© 2024 The Author. Published by Elsevier Ltd. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

questions in animal models, she translated and informed their work by investigating the less controlled and chaotic human experience. Individuals respond to their environment via homeostatic adjustments of their stress/arousal systems, managing the situation [7]. The withdrawal of the parasympathetic nervous system and activation of the stress systems produces hormones like epinephrine and cortisol, affecting physiological systems throughout the body altering cognitions and behaviors, modulating immune function, and after long term activation can culminate in poorer mental and physical health [5].

Her foundational research has significantly influenced the fields of psychoneuroimmunology and health psychology and now reaches other fields like nursing, healthcare, and public health, where there are multiple movements globally to shift from the biomedical model of illness to the biopsychosocial model of health [2,8]. This shift not only challenges healthcare and medical systems to change; it also has implications for the human socio-political, cultural, and environmentally built systems present today [9]. Dr. Kiecolt-Glaser has over 300 publications and cited nearly 79,000 times (as of 2024.09.15 according to Google scholar); it is impossible to cover all of her contributions in detail. Instead, this contextualized review will outline her major stress and health contributions that forged changes in our understanding of human experience and the embodiment of stress.

3. Dr. Kiecolt-Glaser's major stress & health contributions: A brief review

3.1. Psychological stress alters immune functioning: accelerating aging

Beginning with medical students, Dr. Kiecolt-Glaser detailed how psychological stress alters bodily functioning, not only the mind, by altering several facets of immune function including decreased lymphocyte populations [10,11], impaired wound healing [12], and herpesvirus reactivation [13]. Next, the stress-immune connection was characterized among older adults caregiving for their parent or spouse with dementia; findings replicated the decreased immunity of those young adults under exam stress and extended to poorer vaccination responses among the caregivers [14] and accelerated aging as indexed by increased systemic inflammation [15] and shortened telomeres [16]. Several reviews and chapters [e.g. Refs. [17–19]] were written outlining both protective and risk factors for the accelerated aging of the immune system. Currently, it is common for researchers to discuss chronological and biological age as two different constructs: Dr. Kiecolt-Glaser's work starting in the 1990s began to highlight the role stress plays in accelerating the biologically aging of the immune system compared to its chronological age [20].

3.2. Social connections and their immune consequences

Two of her most cited publications focus on how social support buffers (cited on average 163 times/year) [21] and distressing marriages (cited on average 168 times/year) [22] affect health through physiological changes associated with stress, especially neuroendocrine and immune functioning. Dr. Kiecolt-Glaser's research initially focused on identifying factors like marital discord and hostility that drove poorer health outcomes such as poor wound healing, greater inflammatory responses, poorer cellular immune function, and chronic inflammation [e.g. Refs. [23–25]]. In the past decade or so, she and her colleagues have expanded our understanding of marital and intimate relationships in 2 main ways: (1) examination of metabolic and digestive pathways linking marital discord to poorer health [e.g. Refs. [26–28]] and (2) how the couple's dyadic rhythms, physiological interdependence and communication can be both protective and harmful [e.g. Refs. [29–31]].

The consequences of poor social connection, whether friend or partner, and loneliness were demonstrated in multiple populations, including older adults [32], cancer survivors [33,34], and newlyweds [35]. On the flip side, Dr. Kiecolt-Glaser's work has highlighted how

strong relationships are linked to better health outcomes [36], especially among cancer survivors [37,38]. Thus, her work over the past 35 years has detailed how social connections, especially marriage, and the quality can both enhance or harm one's health through changes in neuroendocrine-immune functioning. This evidence supports that one's immediate context affects the functioning of both the mind and body.

3.3. Depression as a mind-body issue

Dr. Kiecolt-Glaser's first publication with depression/depressive disorder in the title was in 1990 [39]. It focused on the increased prevalence rates of depressive disorders among dementia familial caregivers, even in those without a personal or family history of depression-related disorders (a known risk factor), compared to non-caregivers. Over the next 3 decades, her work often focused on distress and depressive symptoms as key factors to understanding how the immune system reacts to our psychosocial context [40]. However, her contributions to understanding the diverse and complex pathways linked to depression and depressive symptoms have expanded over the past 10 years. While some might think it is too early to identify this area as a major contribution, this recent focus has highlighted how complex the human experience of depression can be.

Depression can co-occur with pain and fatigue and these symptoms are linked to elevated systemic inflammation in patient populations such as cancer survivors [41]. Dr. Kiecolt-Glaser and colleagues elegantly tested the social signal transduction model of depression by examining how interpersonal stressful events and inflammatory stress reactivity predicted depressive symptoms across two different populations, breast cancer survivors and sedentary adults [42]. Further due to comprehensive study designs that use cutting edge technology, she has provided evidence that among breast cancer survivors, cognitive function related to depressive symptoms and inflammation was linked to elevated intestinal permeability or leaky gut [43]. Using her couple's research approach, she found that less satisfied couples had greater increases in depressive symptoms over a 3-month period compared to their more satisfied counterparts and the changes in depressive symptoms were linked to a decrease in gut microbiome diversity and increase in circulating endotoxin, a proxy for leaky gut [27]. Taken together, depressive symptoms, a collection of cognitions and behaviors traditionally thought only to be a product of the brain or a mental health condition, appears to be related to peripheral functioning of the immune system that is linked to the intestinal wall's integrity and gut microbiome, blurring the lines between mental and physical health and reuniting the mind and body.

4. Lessons learned from Dr. Kiecolt-Glaser

In June 2010, I joined her lab after completing my PhD in Biobehavioral Health at the Pennsylvania State University. Being an unusual post-doc for her lab – my training was not based in a psychological discipline and my dissertation was an experimental manipulation using mice – I had a steep curve to climb up linked to conducting research on human samples (e.g., minimal control relative to animal models, advanced statistical analysis) and my writing was less than great. I'm not sure if she cringed, maybe even rolled her eyes, while providing feedback on my first draft, but she guided and trained me in the art of skillful writing. The knowledge and tools I learned from her has exponentially assisted my career success and the trainees I coach.

As a principal investigator, Dr. Kiecolt-Glaser was a phenomenal researcher, thoughtful leader, and humble mentor. She treated me as a colleague and empowered me to use my voice and share my knowledge with the team. There were two aspects that I took for granted while I worked with her. At the time, the intellectual environment that she and her greatest collaborator, the late Dr. Ron Glaser, developed was priceless for all who were lucky enough to train there. She led a strong team with amazing collaborators from varying fields that propelled the whole group to success. The Stress & Health lab was an interdisciplinary

research playground. Second, all her studies either only recruited women or both women and men. At the time, it was not odd to me; however, as I reflect on her career, she has always advanced knowledge surrounding stress and health in women, not something that many biomedical researchers historically did or even today strive to do because the female's hormonal milieu can be "complicated".

Dr. Kiecolt-Glaser trailblazed in psychoneuroimmunology at a time when women had few colleagues let alone role models. As I left for UNC Charlotte, I recall her telling me to be authentic (I like to bake!). However, she cautioned me in sharing this talent as I started my career because other aspects linked to baking might be projected on my work-related performance, especially as a female. I did heed her advice for a short time; baking is a stress management tool for me and being an assistant professor was stressful! She also empowered me to know my worth and advocate for myself; advice that is always good to recall, at any stage of one's career.

5. Greater implications of her work

As I reflect 12 years into my independent career, Dr. Kiecolt-Glaser's influence has directly altered numerous undergraduate, graduate and post-doctoral trainees, collaborators, and other minds through her prolific career. In 2009, she identified psychoneuroimmunology as a gateway for psychology to influence the medical field [44]. I would argue that her human-focused psychoneuroimmunology research, along with the field globally, has begun a paradigm shift, *reuniting* the mind and body in this post-Cartesian world. Thus, the next generation must pick up the torch and further this paradigm shift.

An anonymous grant reviewer recently told me that *everyone knows* that the mind and body are connected. I disagree. There are many examples of how post-Cartesian philosophy is engrained in our world. The built systems – from healthcare, education, transportation, hospitality, research development, construction, government, etc. – do not often make space for humans to grow and rest. Anytime, a human's resources (e.g., mental, emotional, physical, financial, etc.) are overwhelmed by their demands and they are not given the space to stop, reflect, and overcome, their mind and body are split because they must choose one over the other to be successful. As one ages, the plasticity of their body wanes, resulting in chronic illnesses as their body limits the abuse it will or can take.

For example, the recent societal level stress response and reactivity, and slow recovery from the global COVID-19 pandemic displayed how fragile humans and our built systems are [9]. The success of systems relies on humans who often are forced to ignore their body to get the job done, leading to exhaustion and possibly chronic disease development. In the immediate wake of the SARS-CoV-2 outbreak, the cognitive and emotional responses were varied and ranged from individuals resisting the government's mandated behavior restrictions (e.g., staying at home or required to wear a mask) to never leaving the house out of fear of contracting the deadly virus. Albeit, the vast majority were more moderate and fell in between those two extremes, however, these extreme responses were likely the result of disconnected and overly taxed minds and bodies with little to no resources [45]. Further, marginalized populations [46] and those with typical elevated risk (e.g., elderly, compromised immune function, etc. [47]) – those who experience greater dysfunction among their neuroendocrine and immune systems – were more likely to experience severe symptoms and be hospitalized or die from COVID-19.

Specific to the workforce, the Great Resignation was a symptom indicating that employers had created an unsustainable environment that can drive a wedge between the mind and body [48]. This employee reaction created even more stress and disillusionment for those who chose to stay or could not leave. Unfortunately, many systems, especially in the US, do not attend to the whole human, their biopsychosocial experience, and reward performance levels that often are not sustainable. Being nearly 5 years after the global outbreak began, this global

potentially traumatic event has and will continue to affect our built systems and the individuals in them. While most individuals will be resilient [49], as is true to our human nature, a portion of the population will struggle. Could the work of Dr. Kiecolt-Glaser and other psychoneuroimmunology experts be translated into real system change?

Another piece of evidence includes the ever increasing anxiety and depressive symptoms [50] and diagnoses of severe health conditions, both mental and physical [51], among young adults. In the US, this trend has been occurring since the early 2000s and has been exacerbated by the recent global pandemic [52]. If the sociocultural systems were supporting the integration of the mind and body, young adults would be leaving their familial context as strong and resilient individuals; however, the data do not appear to support that. The demand of mental support service [53,54] and the rise to meet the needs of other student success services on higher education campuses [55] suggest that young adults are ill-prepared for navigating the complex world independently. From the stress and resilience lens, our sociocultural systems are failing our young people by separating the mind and body and not helping parents develop and model strong socioemotional skills [56] or by not enabling or creating space in the curriculum for the primary and secondary educators to model and facilitate the learning and development of these skills [57]. Thus, we need to translate these psychoneuroimmunological findings linking stress to the whole integrated human – mind and body – functioning to lay audiences and engage with those responsible for policy to continue this paradigm shift. It will not be quick as the changes require most of the population to understand the need for change and for multiple systems to adjust [58,59], requiring financial investment likely without an immediate return on the investment.

6. Conclusion

Dr. Kiecolt-Glaser created a strong foundation outlining how stress and adversity alter the functioning of the neuroendocrine-immune systems. Their functioning can be influenced by individual differences, past negative histories and poor social connections, that have cascading effects on the integrity of the mind and body. These alterations increase the risk of further dysregulation creating a negative vicious cycle that is difficult to halt and can have long term detrimental health effects. We have the tools at hand to help the systems we function in and support the minds and bodies that make them up. It is time to pick up the torch and continue moving the needle to honor the giant whose shoulders we stand on.

Funding

No funding supported the drafting or editing of this manuscript.

CRediT authorship contribution statement

Jeanette M. Bennett: Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

Declaration of competing interest

None.

Acknowledgements

Thank you, Dr. Janice Kiecolt-Glaser!! You took a chance on me, a post-doc with an unusual background. I know I would not be who or where I am today without your guidance and mentorship; you are the giant that allowed me to stand on her shoulders and now I pay it forward. A special thanks to all my OSU-IBMR Stress & Health Lab research family, especially Dr. Chris Fagundes for organizing this special tribute. They all believed in my potential and helped me grow as a scientist and scholar. I further want to highlight the role my past and current research

collaborators, especially Drs. Shannon Sullivan and Joachim Sturmborg, and all the undergraduate and graduate trainees who have encouraged me in their unique ways to explain the science of stress and health in accessible ways and to challenge my biases. I also desire to recognize the critical part that my husband, Jason, and son, Will, have played, since the beginning of my academic career; they have taught me, in the most tangible ways, about how valuable close relationships are and the power that they have on our daily experiences, especially our health.

References

- [1] G. Hatfield, *René Descartes*. The Blackwell Guide to the Modern Philosophers: from Descartes to Nietzsche, 2017, pp. 1–27.
- [2] E. Rocca, R.L. Anjum, Complexity, reductionism and the biomedical model. Rethinking Causality, Complexity and Evidence for the Unique Patient: A CauseHealth Resource for Healthcare Professionals and the Clinical Encounter, 2020, pp. 75–94.
- [3] A. Farre, T. Rapley, The new old (and old new) medical model: four decades navigating the biomedical and psychosocial understandings of health and illness, in: Healthcare, MDPI, 2017.
- [4] L.G. Roos, et al., The measurement of stress, in: R. Gurung (Ed.), Routledge Encyclopedia of Psychology in the Real World, Taylor & Francis Group, London, 2022.
- [5] R. Glaser, J.K. Kiecolt-Glaser, Stress-induced immune dysfunction: implications for health, Nat. Rev. Immunol. 5 (2005) 243–251.
- [6] R. Glaser, J.K. Kiecolt-Glaser, Stress-associated immune modulation: relevance to viral infections and chronic fatigue syndrome, Am. J. Med. 105 (3) (1998) 35S–42S.
- [7] J.M. Bennett, et al., Inflammation–nature’s way to efficiently respond to all types of challenges: implications for understanding and managing “the epidemic” of chronic diseases, Front. Med. 5 (2018) 316.
- [8] J.P. Sturmborg, et al., Health and disease—emergent states resulting from adaptive social and biological network interactions, Front. Med. 6 (2019) 59.
- [9] F. Tretter, et al., Perspectives of (/memorandum for) systems thinking on COVID-19 pandemic and pathology, J. Eval. Clin. Pract. 29 (3) (2023) 415–429.
- [10] J.K. Kiecolt-Glaser, et al., Psychosocial modifiers of immunocompetence in medical students, Psychosom. Med. 46 (1) (1984) 7–14.
- [11] J.K. Kiecolt-Glaser, et al., Modulation of cellular immunity in medical students, J. Behav. Med. 9 (1986) 311–320.
- [12] P.T. Marucha, J.K. Kiecolt-Glaser, M. Favagehi, Mucosal wound healing is impaired by examination stress, Psychosom. Med. 60 (1998) 362–365.
- [13] R. Glaser, et al., Plasma cortisol levels and reactivation of latent Epstein-Barr virus in response to examination stress, Psychoneuroendocrinology 19 (8) (1994) 765–772.
- [14] J.K. Kiecolt-Glaser, et al., Chronic stress alters the immune response to influenza virus vaccine in older adults, Proc. Natl. Acad. Sci. U.S.A. 93 (7) (1996) 3043–3047.
- [15] J.K. Kiecolt-Glaser, et al., Chronic stress and age-related increases in the proinflammatory cytokine IL-6, Proc. Natl. Acad. Sci. U.S.A. 100 (15) (2003) 9090–9095.
- [16] A.K. Damjanovic, et al., Accelerated telomere erosion is associated with a declining immune function of caregivers of Alzheimer’s disease patients, J. Immunol. 179 (6) (2007) 4249–4254.
- [17] J.M. Bennett, C.P. Fagundes, J.K. Kiecolt-Glaser, The chronic stress of caregiving accelerates the natural aging of the immune system, in: Immunosenescence, Springer, 2013, pp. 35–46.
- [18] J.P. Gouin, L. Hantsoo, J.K. Kiecolt-Glaser, Immune dysregulation and chronic stress among older adults: a review, Neuroimmunomodulation 15 (4–6) (2008) 251–259.
- [19] J.E. Graham, L.M. Christian, J.K. Kiecolt-Glaser, Stress, age, and immune function: toward a lifespan approach, J. Behav. Med. 29 (4) (2006) 389–400.
- [20] J.K. Kiecolt-Glaser, et al., Childhood adversity heightens the impact of later-life caregiving stress on telomere length and inflammation, Psychosom. Med. 73 (1) (2011) 16.
- [21] B.N. Uchino, J.T. Cacioppo, J.K. Kiecolt-Glaser, The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms, Psychol. Bull. 119 (1996) 488–531.
- [22] J.K. Kiecolt-Glaser, T. Newton, Marriage and health: his and hers, Psychol. Bull. 127 (2001) 472–503.
- [23] J.K. Kiecolt-Glaser, et al., Hostile marital interactions, proinflammatory cytokine production, and wound healing, Arch. Gen. Psychiatr. 62 (2005) 1377–1384.
- [24] J.E. Graham, et al., Cognitive word use during marital conflict and increases in proinflammatory cytokines, Health Psychol. 28 (5) (2009) 621–630.
- [25] L.M. Jaremka, et al., Marital distress prospectively predicts poorer cellular immune function, Psychoneuroendocrinology 38 (11) (2013) 2713–2719.
- [26] L.M. Jaremka, et al., Novel links between troubled marriages and appetite regulation: marital distress, ghrelin, and diet quality, Clin. Psychol. Sci. 4 (3) (2016) 363–375.
- [27] J.K. Kiecolt-Glaser, et al., The gut reaction to couples’ relationship troubles: a route to gut dysbiosis through changes in depressive symptoms, Psychoneuroendocrinology 125 (2021) 105132.
- [28] J.K. Kiecolt-Glaser, et al., Marital discord, past depression, and metabolic responses to high-fat meals: interpersonal pathways to obesity, Psychoneuroendocrinology 52 (2015) 239–250.
- [29] J.K. Kiecolt-Glaser, Marriage, Divorce, and the Immune System, American Psychological Association: US, 2018, pp. 1098–1108.
- [30] M.R. Shrout, et al., Marital negativity’s festering wounds: the emotional, immunological, and relational toll of couples’ negative communication patterns, Psychoneuroendocrinology 149 (2023) 105989.
- [31] J.K. Kiecolt-Glaser, S.J. Wilson, A. Madison, Marriage and gut (microbiome) feelings: tracing novel dyadic pathways to accelerated aging, Psychosom. Med. 81 (8) (2019) 704–710.
- [32] S.J. Wilson, et al., Linking marital support to aging-related biomarkers: both age and marital quality matter, J. Gerontol.: Ser. Bibliogr. 76 (2) (2021) 273–282.
- [33] C.P. Fagundes, et al., Social support and socioeconomic status interact to predict Epstein-Barr virus latency in women awaiting diagnosis or newly diagnosed with breast cancer, Health Psychol. 31 (1) (2012) 11–19.
- [34] L.M. Jaremka, et al., Loneliness promotes inflammation during acute stress, Psychol. Sci. 24 (7) (2013) 1089–1097.
- [35] J.K. Kiecolt-Glaser, et al., Love, marriage, and divorce: newlyweds’ stress hormones foreshadow relationship changes, J. Consult. Clin. Psychol. 71 (2003) 176–188.
- [36] K.L. Heffner, et al., Spousal support satisfaction as a modifier of physiological responses to marital conflict in younger and older couples, J. Behav. Med. 27 (2004) 233–254.
- [37] M.R. Shrout, et al., Relationship satisfaction predicts lower stress and inflammation in breast cancer survivors: a longitudinal study of within-person and between-person effects, Psychoneuroendocrinology 118 (2020) 104708.
- [38] M.R. Shrout, et al., Breast cancer survivors’ satisfying marriages predict better psychological and physical health: a longitudinal comparison of satisfied, dissatisfied, and unmarried women, Psycho Oncol. 30 (5) (2021) 699–707.
- [39] J.R. Dura, K.W. Stukenberg, J.K. Kiecolt-Glaser, Chronic stress and depressive disorders in adult children caring for demented parents, Psychol. Aging 6 (1990) 467–473.
- [40] J.K. Kiecolt-Glaser, H.M. Derry, C.P. Fagundes, Inflammation: depression fans the flames and feasts on the heat, Am. J. Psychiatr. 172 (11) (2015) 1075–1091.
- [41] L.M. Jaremka, et al., Pain, depression, and fatigue: loneliness as a longitudinal risk factor, Health Psychol. 33 (9) (2014) 948.
- [42] A.A. Madison, et al., Frequent interpersonal stress and inflammatory reactivity predict depressive-symptom increases: two tests of the social-signal-transduction theory of depression, Psychol. Sci. 33 (1) (2022) 152–164.
- [43] A.A. Madison, et al., Depression, inflammation, and intestinal permeability: associations with subjective and objective cognitive functioning throughout breast cancer survivorship, Cancers 15 (17) (2023) 4414.
- [44] J.K. Kiecolt-Glaser, Psychoneuroimmunology: psychology’s gateway to the biomedical future, Perspect. Psychol. Sci. 4 (4) (2009) 367–369.
- [45] G.A. Bonanno, S. Chen, I.R. Galatzer-Levy, Resilience to potential trauma and adversity through regulatory flexibility, Nature Reviews Psychology 2 (11) (2023) 663–675.
- [46] V. Abedi, et al., Racial, economic, and health inequality and COVID-19 infection in the United States, Journal of racial and ethnic health disparities 8 (2021) 732–742.
- [47] M. O’Driscoll, et al., Age-specific mortality and immunity patterns of SARS-CoV-2, Nature 590 (7844) (2021) 140–145.
- [48] M.T. Tessema, et al., The “great resignation”: causes, consequences, and creative HR management strategies, J. Hum. Resour. Sustain. Stud. 10 (1) (2022) 161–178.
- [49] G.A. Bonanno, et al., Resilience and disaster: flexible adaptation in the face of uncertain threat, Annu. Rev. Psychol. 75 (1) (2024) 573–599.
- [50] W. Li, et al., Prevalence and associated factors of depression and anxiety symptoms among college students: a systematic review and meta-analysis, JCPP (J. Child Psychol. Psychiatry) 63 (11) (2022) 1222–1230.
- [51] S.B. Oswalt, et al., Trends in college students’ mental health diagnoses and utilization of services, 2009–2015, J. Am. Coll. Health 68 (1) (2020) 41–51.
- [52] L. Kauhanen, et al., A systematic review of the mental health changes of children and young people before and during the COVID-19 pandemic, Eur. Child Adolesc. Psychiatr. 32 (6) (2023) 995–1013.
- [53] R.W. Emmertson, C. Camilleri, S. Sammut, Continued deterioration in university student mental health: inevitable decline or skirting around the deeper problems? Journal of Affective Disorders Reports 15 (2024) 100691.
- [54] N. Salimi, et al., College students mental health challenges: concerns and considerations in the COVID-19 pandemic, J. Coll. Student Psychother. 37 (1) (2023) 39–51.
- [55] A.M. Lederer, et al., More than inconvenienced: the unique needs of US college students during the COVID-19 pandemic, Health Educ. Behav. 48 (1) (2021) 14–19.
- [56] United States. Public Health Service, Office of the Surgeon General. *Parents Under Pressure: the U.S. Surgeon General’s Advisory On the Mental Health & Well-Being Of Parents*, U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, Rockville, MD, 2024.
- [57] J.M. Bennett, N. Rohleder, J.P. Sturmborg, Biopsychosocial approach to understanding resilience: stress habituation and where to intervene, J. Eval. Clin. Pract. 24 (6) (2018) 1339–1346.
- [58] J.P. Sturmborg, P. Tzasis, L. Hoemeke, COVID-19—an opportunity to redesign health policy thinking, Int. J. Health Pol. Manag. 11 (4) (2022) 409.
- [59] M. Borge, Y. Xia, Beyond the individual: the regulation and negotiation of socioemotional practices across a learning ecosystem, J. Learn. Sci. 32 (3) (2023) 325–375.