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(REVIEW ARTICLE)

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A review on immunity through stress reduction and positive mindset

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Abstract

The intricate network of cells and processes that makes up the immune system is a vital first line of defense against dangerous infections. This review explores the complex relationships that exist between immunity, stress, and psychological resilience, emphasizing the role that stress management and an optimistic outlook have in influencing immune function. An adaptable collection of mental and affective functions known as the Behavioral Immune System (BIS) aids in avoiding possible infection sources. Acute stress can momentarily stimulate immune function, but chronic stress results in immunological dysregulation, protracted inflammation, and heightened disease risk. A major risk factor for long-term immunological alterations, such as elevated inflammatory markers and the reactivation of dormant viruses, is early life stress (ELS). Optimism, good affect, and a sense of purpose in life are all components of positive psychological well-being (PPWB), which is linked to better immunological responses and better health outcomes. While optimism's impacts on immune function can vary depending on the context of stressors, it does seem to improve health-promoting behaviors and adaptive coping mechanisms. In order to lessen the negative effects of stress and increase immunological resilience, the review highlights the significance of including psychological therapies. Reducing stress-related health risks and enhancing general well-being may be greatly aided by the development of techniques that encourage optimistic thinking and emotional resilience.

Keywords: Behavioral Immune System; Early life stress; Psychological well-being; Immunity

1. Introduction

Immunity involves the immune system, which is made up of various cells, substances, and mechanisms that work together to preserve the skin, respiratory, and intestinal systems, as well as other tissues, from harmful foreign substances called antigens. These antigens can include bacteria, fungi, viruses, cancer cells, and toxins. The immune system is categorized into two primary "lines of defense": innate immunity and adaptive immunity [1], along with structural and chemical barriers that help thwart infections. Innate immunity serves as the body's first line of defense against invading pathogens, responding quickly in a non-specific manner that does not rely on recognizing specific antigens and, it does not have immunologic memory. In comparison, adaptive immunity takes longer to mount a complete response after first encountering an antigen, as it is both specific and antigen-dependent. This type of immunity possesses memory, allowing for a quicker and more efficient response to subsequent exposures to the same antigen. Disorders like hypersensitivity reactions can occur due to malfunctions in either the innate or adaptive immune responses, often resulting from an overly active immune system. Organisms have been under environmental pressure to evolve since the beginning of existence. The capability to adapt to environmental dangers or stressors, such as predators or natural disasters, improved survival and, consequently, reproductive potential. Research on humans and animals demonstrates that immunological mediators affect how the brain responds to information both physically and behaviorally [2]. This includes immune system effects that may have an impact on behavioral and emotional aspects of resilience. The main goal of this review paper is to critically assess the current body of research about the reciprocal relationship between immunity and resilience.

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2. Material and methods

The literature was reviewed from 2015-2022 using keywords: Behavioral Immune System, early life stress, psychological well-being, immunity. Search engines such as PubMed Central, Google Scholar, and Cochrane were used by applying the Boolean operator 'AND' or 'OR' based on the exclusion criteria (articles in languages other than English) and lack of standardized assessing tools. All the available full text in the English language was compiled and thoroughly studied and 10 full-text articles were selected and reviewed.

2.1. Inclusion criteria

Studies meeting the following criteria were included in the study

- Published in peer-reviewed journals,
- Available in electronic databases,
- Articles written only in English were considered for the review,
- Methods of statistical analysis used.

2.2. Screening and Data extraction

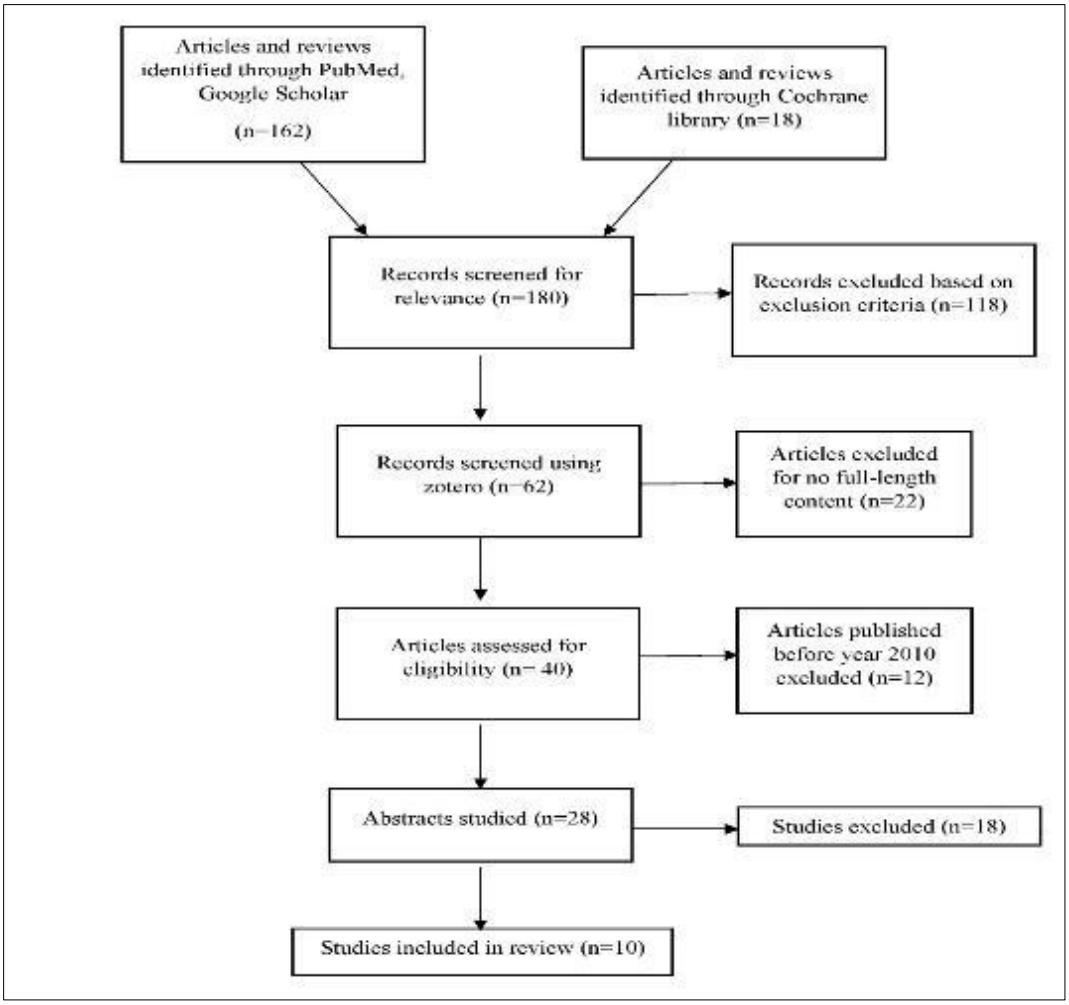

Figure 1 Flowchart of the study selection process

The search titles were uploaded in Zotero software. Firstly, the titles were screened and selected as per their relevance to the topic. Secondly, the abstracts of the relevant titles were read and screened. Thirdly, screening of full-length texts and abstracts and included as per inclusion criteria (fig-1). The data extraction was done and details regarding publication, methodology, and results were recorded.

2.3. Search Result

A list of 162 articles was obtained from the searches of electronic databases (fig-1). Based on the inclusion criteria the studies are included. Ten full-length papers were identified and included to form the basis of the review. All the findings from the studies indicate association between stress and optimism in immunity.

3. The Behavioural Immune System

Based on current theory, BIS is an evolutionary motivating system that aimed to change behaviour and limit contact with pathogens [3]. As a coordinated set of emotional and cognitive mechanisms that react to cues and direct behaviour that keeps the individual away from contagious sources, it is defined as a set of detection mechanisms that enable people to recognize possible pathogen sources. [4]

Studies demonstrating that we are able to identify unwell people using a variety of clues provide more evidence that humans possess the BIS. According to a study, those who were primed with sickness cues reported being less extroverted and receptive to new experiences [5]. As the primary investigators in the BIS, social psychologists naturally focused on people, and their primary research interests were the social ramifications of mistaken detection (e.g., social categorization, cross-cultural differences).

3.1. Effects of Stress on the Immune System:

Stress encompasses a variety of challenging situations, or "stressors," along with the physiological and psychological responses they trigger in the body and mind. The immune system is one of the systems that reacts to these stressors in both humans and animals. Scientific research has established a link between stress and various components of the immune system. During short episodes of acute stress, certain immune cells are released into the bloodstream, preparing the body for potential harm or infection in a "fight or flight" response [6]. Both acute and chronic stress are associated with increased levels of pro-inflammatory cytokines, although the health implications of chronic stress, which can persist from days to years, can differ. While short-term inflammation is necessary for combating infections and initiating healing, prolonged systemic inflammation indicates immune system dysfunction and increases the risk of chronic health issues such as atherosclerosis and frailty. Additionally, long-term stress can trigger the activation of dormant viruses, suggesting a loss of immune control, and frequent activation may lead to further deterioration of the immune system.

3.2. Taxonomy of Stressors

The taxonomy includes five categories of stressors. Acute time-limited stressors include challenges like public speaking or mental arithmetic. Brief naturalistic stressors, involve a person confronting a real-life short-term challenge as in academic examinations. In stressful event sequences, a focal event, such the death of a spouse or a significant natural disaster, triggers a chain reaction of related difficulties [7].Chronic stressors, differ from the other demands we've discussed in that they typically affect an individual's entire life, requiring them to rearrange their identity or social positions. Another characteristic of chronic stresses is their stability; the individual is either assured that the difficulty will never cease or is unsure of when it will end. Distant stressors are traumatic events that happened a long time ago, but because of their lingering emotional and cognitive effects, they may still alter immune system function. [8,9]

3.3. Early life stress and its effect in immunity

Early life stress (ELS), such as maltreatment, poverty, and bullying, has significant immunological effects that can be observed both shortly after the stress and in later [10]. Research indicates that children who experience ELS exhibit immunological dysregulation, characterized by lower baseline levels of cytokines essential for immune function [11]. In laboratory studies, immune cells from these children showed an increased production of pro-inflammatory cytokines when stimulated. While much research has concentrated on maltreatment and poverty, recent findings also highlight the negative impact of chronic bullying, which is linked to a sharper rise in C-reactive protein (CRP) levels from childhood into young adulthood. Additionally, adults who faced ELS, particularly those subjected to repeated sexual or physical abuse in early childhood, show elevated levels of antibodies against Epstein-Barr virus (EBV), indicating viral reactivation. A meta-analysis confirmed a positive relationship between ELS and several inflammatory markers in adults, especially CRP. Investigations into the mechanisms connecting ELS to immune changes have considered factors like self-control, body fat, smoking, and stress, and have explored how inflammatory dysregulation may contribute to health issues later in life [12].Moving forward, it is essential to develop evidence-based interventions to address the immunological impacts of ELS, with recent studies suggesting that such strategies could improve inflammatory profiles in youths from low-income backgrounds.

4. Integrating Behavioural and Physiological Immunity

An expanding corpus of research in the psychological sciences is starting to clarify how the physiological immune system both influences and is influenced by the BIS [13]. The first is a matter of scale: up until now, physiological BIS research has focused mostly on the connections between immune processes and overt social cognition and behavior. In contrast, PNI research has often addressed questions about the mechanistic pathways that link the immune system to the brain. For a second reason, PNI is mostly concerned with the dysregulation of otherwise adaptive systems (such cytokine-induced depression) or reactive psychological responses to infections that are already present.

An immune reaction can be momentarily incapacitating due to fever, exhaustion, and other physiological effects of an aggressive immune response [13]. It is also metabolically expensive, using calories that could be allocated to other vital physiological systems. A separate set of proactive mechanisms that direct organisms' behavior to prevent pathogen interaction in the first place would have provided extra fitness benefits in light of the limitations and expenses associated with immune defense against diseases. A form of behavioral prophylaxis against infection is provided by these processes. The idea that these systems make up a behavioral immune system that is distinct from and supplemental to the "real" immune system is, in fact, more than just metaphorical.

The behavioral immune system is characterised by mechanisms that facilitate adaptive psychological responses to perceptual cues suggesting the presence of pathogens in the immediate perceptual environment, including the presence of pathogens in conspecifics. The ‘real' immune system is defined by mechanisms that facilitate adaptive immunological reactions to pathogens that enter the body. Individual species may have different perceptual surveillance and behavioral reaction mechanisms, but all species share the presence of these mechanisms for detection and response [14].

4.1. Positive Thinking

As a significant health-related factor that has been associated with better mental and physical health outcomes (Kubzansky LD et.al., 2018, Levine GN et.al., 2021, Martín-María N et.al., 2017), positive psychological well-being (PPWB) has drawn attention (Kubzansky LD et.al., 2018). Many components of positive psychological well-being (PPWB), such as optimism, positive affect, and life purpose, have been shown to be prospectively linked to better health outcomes, frequently without regard to medical or demographic factors (Kim EK et.al., 2019, Cohen S et.al., 2016, Petrie K et.al., 2018). Major medical groups, including the American Heart Association, have begun to pay more attention to the health impacts of PPWB in light of the mounting evidence concerning the advantages of well-being (Kubzansky LD et.al., 2018).

PP treatments are successful in fostering PPWB, and this makes them very promising as health-improving interventions (Huffman et al., 2022). PPWB is obviously and prospectively connected with superior health outcomes (Xie et al., 2022). In the meanwhile, a number of important problems still need to be resolved in order to advance both the clinical and scientific uses of PP interventions in healthcare settings.

So far, self-report measures have been the primary tool used to measure improvements in well-being. The popular Positive Affect Negative Affect Scale, for example, evaluates high-activation positive affect without taking other features of positive affect into account, which has significant drawbacks (Narayanan et al., 2020). Other measures may only measure one or more parts of a construct. These measures are not validated in minority populations, frequently rely on reports over extended periods of time that are challenging for most people to accurately gauge, and may not even exist robustly for some constructs (e.g., state optimism).

The importance of mechanism and mediation cannot be overstated. However, if large pivotal trials centered on clinical outcomes are conducted before a thorough understanding of the mechanism has been gained, a significant delay may occur in the introduction of a "good enough" or "well enough understood" intervention to assist patients immediately. Cognitively grounded psychological personality qualities known as dispositional optimism and pessimism are marked by generalised expectations towards favorable and unfavorable outcomes, respectively (Karacaoglu et al., 2023). Higher dispositional optimism has generally been found to be protective, whilst higher dispositional pessimism has generally been found to be detrimental to the advancement of mental and physical health conditions.

Dispositional optimism and pessimism's effects on stress processes provide an explanation for how they may impact both psychological and physical health. In particular, compared to those with higher dispositional pessimism, those with higher dispositional optimism tend to engage in more frequent health-promoting behaviors and benefit from the adaptive physiologic corollaries of effective coping.

A prevalent perspective posits that dispositional optimism and pessimism impact transactional processes of daily living, including stress response mechanisms. It is possible to observe wider, longer-term health advantages through the cumulative impact of dispositional optimism and pessimism on how stressors are experienced (and subsequently reported) over time. The immune system's reaction to optimism is clearly influenced by context and the features of stressors. The general consensus seems to be that higher immune markers are positively correlated with optimism. Positive people may be more vulnerable to the damaging effects of difficult circumstances on their immune systems, according to a number of studies. When it comes to cellular technology, it appears that hoping for the best doesn't always work out.

Abbreviation

PNI- Psychoneuroimmunity, Early life stress (ELS), psychological well-being (PPWB), Behavioural Immune System (BIS)

5. Conclusion

Early and late life stresses, such as childhood and adolescence, have been linked to immunological dysregulation that may be severe and long-lasting in those subjected to chronic stressors, such as abuse or caring for others. Thinking positively has the ability to protect against illnesses like the common cold. Our body's innate resistance to illness can be weakened by stress. Keeping an optimistic mindset can help us combat stress and safeguard our immune system. Not only can persistently negative thinking impair the body's immunological response, but it can also prolong the healing process following surgery and even make it harder to treat major illnesses like cancer and heart problems. It is obvious that the context and features of stressors might affect how the immune system reacts to optimism. Optimism seems to be positively correlated often with elevated immune markers.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no competing interest

References

[1] Chinen J, Shearer WT. Innate and Adaptive Immunity. In: Stiehm's Immune Deficiencies. 1st ed. Springer; 2022:1-14. doi:10.1007/978-3-031-12867-7_1.

[2] Dantzer R, Cohen S, Russo SJ, Dinan TG. Resilience and immunity. Brain Behav Immun. 2018;74:28-42. doi:10.1016/j.bbi.2018.08.010.

[3] Murray, Damian & Schaller, Mark. (2016). The behavioral immune system: Implications for social cognition, social interaction, and social influence. 10.1016/bs.aesp.2015.09.002.

[4] Ackerman, J. M., Hill, S. E., & Murray, D. R. (2018). The behavioral immune system: Current concerns and future directions. Social and Personality Psychology Compass, 12(2), 57–70. https://doi.org/10.1111/spc3.12371

[5] Shattuck EC, Perrotte JK, Daniels CL, Xu X, Sunil TS. Signaling sickness: the role of recalled sickness behavior and psychosocial factors in shaping communication style. Evol Med Public Health. 2021;9(1):221-231. Published 2021 Jun 11. doi:10.1093/emph/eoab017

[6] Dhabhar FS. Effects of stress on immune function: the good, the bad, and the beautiful. Immunol Res. 2015;58(2-3):193-210. doi:10.1007/s12026-014-8517-0.

[7] Vande Griek OH, Clark MA, Witte TK, Nett RJ, Moeller AN, Stabler ME. Development of a taxonomy of practice-related stressors experienced by veterinarians in the United States. J Am Vet Med Assoc. 2018;252(2):227-233. doi:10.2460/javma.252.2.227

[8] Kira, I.A. (2021). The Development-Based Taxonomy of Stressors and Traumas: An Initial Empirical Validation. Psychology.

[9] Baum, A., Cohen, L., & Hall, M. (1993). Control and instrusive memories as possible determinants of chronic stress. Psychosomatic Medicine, 55(3), 274–286.

[10] Ochi, S., Dwivedi, Y. Dissecting early life stress-induced adolescent depression through epigenomic approach. Mol Psychiatry 28, 141–153 (2023). https://doi.org/10.1038/s41380-022-01907

[11] Propper DJ, Balkwill FR. Harnessing cytokines and chemokines for cancer therapy. Nat Rev Clin Oncol. 2022;19(4):237-253. doi:10.1038/s41571-021-00588.

[12] Terkelsen MH, Klaestrup IH, Hvingelby V, Lauritsen J, Pavese N, Romero-Ramos M. Neuroinflammation and Immune Changes in Prodromal Parkinson's Disease and Other Synucleinopathies. J Parkinsons Dis. 2022;12(s1):S149-S163. doi:10.3233/JPD-223245

[13] Schaller, H. and Karing, C. (2024). Improving Mindfulness, Well-Being, and Stress: No Additional Benefits of Mindfulness Apps in Natural Settings—A Randomized Trial. Ecopsychology, 16(3), pp.191–199. doi:https://doi.org/10.1089/eco.2024.0004.

[14] van Leeuwen, F., Jaeger, B., & Tybur, J. M. (2023). A behavioural immune system perspective on disgust and social prejudice. Nature Reviews Psychology, 2, 676-687. https://doi.org/10.1038/s44159-023-00226-4

[15] Kubzansky LD, Huffman JC, Boehm JK, Hernandez R, Kim ES, Koga HK, Feig EH, Lloyd-Jones DM, Seligman MEP, Labarthe DR. Positive Psychological Well-Being and Cardiovascular Disease: JACC Health Promotion Series. J Am Coll Cardiol. 2018 Sep 18;72(12):1382-1396. doi: 10.1016/j.jacc.2018.07.042. PMID: 30213332; PMCID: PMC6289282.

[16] Levine GN, Cohen BE, Commodore-Mensah Y, Fleury J, Huffman JC, Khalid U, Labarthe DR, Lavretsky H, Michos ED, Spatz ES, Kubzansky LD. Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association. Circulation. 2021 Mar 9;143(10):e763-e783. doi: 10.1161/CIR.0000000000000947. Epub 2021 Jan 25. PMID: 33486973.

[17] Martín-María N, Miret M, Caballero FF, et al. The Impact of Subjective Well-being on Mortality: A Meta-Analysis of Longitudinal Studies in the General Population. PsychosomMed.2017;79(5):565-575. doi:10.1097/PSY.0000000000000444

[18] Kim EK, Cho YM. Response to Comment on Kim et al. The Effect of a Smartphone-Based, Patient-Centered Diabetes Care System in Patients With Type 2 Diabetes: A Randomized, Controlled Trial for 24 Weeks. Diabetes Care 2019;42:3-9. Diabetes Care. 2019;42(7):e126. doi:10.2337/dci19-0021

[19] Cohen S, Gianaros PJ, Manuck SB. A Stage Model of Stress and Disease. Perspect Psychol Sci. 2016;11(4):456-463. doi:10.1177/1745691616646305

[20] Petrie K, Milligan-Saville J, Gayed A, et al. Prevalence of PTSD and common mental disorders amongst ambulance personnel: a systematic review and meta-analysis. Soc Psychiatry Psychiatr Epidemiol. 2018;53(9):897-909. doi:10.1007/s00127-018-1539-5

[21] Moskowitz JT, Jackson K, Freedman ME, et al. Positive Psychological Intervention Effects on Depression: Positive Emotion Does Not Mediate Intervention Impact in a Sample with Elevated Depressive Symptoms. Affect Sci. 2022;4(1):163-173. Published 2022 Oct 6. doi:10.1007/s42761-022-00140-7

[22] Huffman JC, Feig EH, Zambrano J, Celano CM. Positive Psychology Interventions in Medical Populations: Critical Issues in Intervention Development, Testing, and Implementation. Affect Sci. 2022;4(1):59-71. Published 2022 Oct 5. doi:10.1007/s42761-022-00137-2

[23] Xie Y, Xu E, Al-Aly Z. Risks of mental health outcomes in people with covid-19: cohort study. BMJ. 2022;376:e068993. Published 2022 Feb 16. doi:10.1136/bmj-2021-068993

[24] Narayanan L, Abdelrasheed NSG, Nasser RN, Menon S. Dimensional Structure of the Arabic Positive Affect and Negative Affect Scale Adapted From its English Form. Psychol Rep. 2020;123(6):2597-2616. doi:10.1177/0033294119863293

[25] Karacaoglu M, Meijer S, Peerdeman KJ, et al. Susceptibility to Nocebo Hyperalgesia, Dispositional Optimism, and Trait Anxiety as Predictors of Nocebo Hyperalgesia Reduction. Clin J Pain. 2023;39(6):259-269. Published 2023 Jun 1. doi:10.1097/AJP.0000000000001112