


How Stress Influences The Physiological Functions Of The Human Body: A Bibliometric Mapping 2019-2024

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Article Info	ABSTRACT
<p>Keywords: Stress, Physiology, human body, bibliometrics, hyperthermia.</p>	<p>Stress is an important component of modern life and has been widely recognized as a factor that negatively impacts health. The aim of this research is to map the influence of stress on the physiological functions of the human body over the last five years (2019–2024) using data from the Scopus database. Bibliometric analysis was conducted with VOSviewer visualization to depict publication patterns, citations, keywords, and relation-ships between concepts. The results indicate that the United States was the country with the highest number of publications in 2019, with 110 documents. Overall, the keywords "stress", "physiology", and "body" were the most frequently used. However, the topic of "hyper-thermia", a condition where the body temperature is higher than normal, has not been extensively re-searched. This study highlights the importance of un-derstanding in greater detail the mechanisms of the body's response to stress and identifying areas that re-quire further investigation, such as hyperthermia, to ef-fectively address the impact of stress on health.</p>
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INTRODUCTION

Stress has become an integral component of modern life (Thoit, 2010; Suwarni, 2023). Humans in today's world often experience pressure from various aspects of daily life, such as work, interpersonal relationships, financial issues, and other problems. The body's response to stress involves various interrelated and complex physiological systems (Hadi et al., 2017; Yaribeygi et al., 2017).

Globally, stress has been recognized as a factor that negatively impacts health (Schneiderman et al., 2005; Haight et al., 2023). Physiologically, stress can cause deregulation of the immune system, mediated by the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic-adrenal-medullary axis (Mariotti, 2015; Godoy et al., 2018). When a particular situation is interpreted as stressful, it triggers the activation of the HPA axis, which releases the corti-

cotropin-releasing hormone (CRH). The release of CRH stimulates the secretion of the adrenocorticotrophic hormone (ACTH) from the pituitary gland. ACTH then stimulates the adrenal glands to secrete stress hormones such as cortisol and adrenaline (Ranabir & Reetu, 2011; Oken et al., 2017).

Stress can help humans cope with challenges in the short term, but chronic stress can have adverse effects on physical and mental health, such as increased risk of heart disease, digestive disorders, impaired immune function, sleep disturbances, and mental health issues like depression and anxiety (Furman et al., 2018; Di Giuseppe et al., 2021). Previous studies have shown that stress can have a significant impact on many physiological systems, including the cardiovascular system, the HPA axis, and the immune system (Siemińska & Pejsak 2022; Gupta et al., 2023; James et al., 2023). Additionally, stress has been linked to an increased risk of chronic diseases such as diabetes, cardiovascular diseases, and mental health disorders. However, the exact mechanisms by which stress affects these bodily functions and the long-term consequences of chronic stress on health outcomes are not fully understood.

Further research is needed to explore the complex relationship between stress and the physiological functions of the human body, as well as to identify the mechanisms of the body's response to stress in greater detail. Developing effective intervention strategies for managing stress is also crucial in efforts to improve overall human health and well-being. Therefore, this research aims to conduct a bibliometric analysis of the contributions on the influence of stress on the human body's physiology over the last five years, using scientific mapping methods. This study is expected to provide insights into the evolution and current topics in health physiology, as well as identify stress-related diseases and the factors that contribute to stress that need to be monitored

METHODS

This research employs a bibliometric approach to analyze the literature on how stress physiologically impacts the human body (De las Heras et al., 2022). This approach allows researchers to systematically explore and measure the patterns, distribution, and impact of scientific publications related to the research subject (Z. Liu et al., 2023; Gupta et al., 2021).

Bibliometric analysis, as a quantitative methodology, utilizes evaluative and descriptive techniques to characterize research patterns and various attributes of publications. Researchers use a bibliometric visualization approach to present a comprehensive representation of the structure of a particular domain of study. The research sample consists of 356 publications sourced from the Scopus database, specifically those relevant to the selected keywords. The keywords entered in this research consist of ("Stress" AND "Physiology" AND "body" AND "Condition"). The visualization of publications is facilitated through the use of the VOSviewer program, which combines various indications such as the number of publications, number of citations, and the overall strength of the relationships between the depicted items.

The primary objective of this research is to evaluate how stress impacts the physiological functions of the human body in the medical context. By utilizing the bibliometric analysis method, this research aims to determine the relatedness of publication distribution, citation patterns, and keywords. Furthermore, this research will explore the research subject and

highlight areas that require additional research on how stress affects the human body biologically. This research aims to enhance the understanding of the role of stress in stress causation, physiological functions, and long-term health outcomes, as well as to identify the ways in which the body responds to stress (Liao et al., 2023)

RESULTS AND DISCUSSION

Based on the determined criteria, publications of articles during the last five years related to Stress on the Physiological Functions of the Human Body from 2019-2024 can be seen in Figure 1. Figure 1 shows that the research contribution on the impact of Stress on the Physiological Functions of the Human Body reached its peak publication in 2019, with the number of publications reaching 110 documents, and the lowest in 2024 with 10 documents. The increase in the number of research contributions in 2019 is associated with the COVID-19 pandemic. The pandemic can cause stress that stimulates the autonomic nervous system, particularly the sympathetic nervous system, which increases heart rate, blood pressure, and respiration (Saminan et al., 2021). Viral infections or other stress hormone stimulants can cause the release of stress hormones such as adrenaline and cortisol, which can increase the inflammatory response and affect the body's immune system. Physical stress can be caused by the immune response to COVID-19, which weakens the body's immune system and makes people more susceptible to infections, including COVID-19.

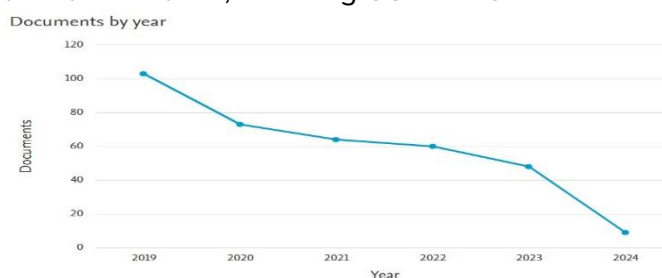


Figure 1. Mapping Database Scopeus Stress Against Physiological Functions of the Human Body from 2019-2024

Cross-country, there are 10 countries that contribute the most in publishing research-related publications are the United States with 120 publications while the least Switzerland has a total of 15 cross-counselling articles that can be viewed in Figure 2.



Figure 2. 10 countries with the most publication contributions

Over the past five years, numerous research contributions have been made regarding Stress on the Physiological Functions of the Human Body, aided by data from the VOSviewer software. There have been several novel developments during the last five years, from 2019 to 2024, with various parameters that demonstrate the relationships between the analyzed concepts, as seen in Figures 1 and 2.

The interconnectedness among keywords within a cluster aims to determine the extent of the contribution of Stress on the Physiological Functions of the Human Body during these past five years by indicating the most popular keywords. Many themes are closely related to Stress on the Physiological Functions of the Human Body, ranging from physiology to body position, as shown in Figure 3 below. The use of VOSviewer for bibliometric studies is conducted to assist researchers in finding novel developments within this theme. The findings from the VOSviewer results contribute significantly to Stress on the Physiological Functions of the Human Body, as illustrated in Figure 3, which provides an overall picture of the research on Stress on the Physiological Functions of the Human Body.

The keyword co-occurrence network generated by VOSviewer provides valuable insights into the prominent themes and concepts associated with the research on stress and its physiological impact on the human body. The visual representation of keywords and their interconnections effectively captures the breadth and complexity of this research domain. As shown in Figure 3, the keywords "stress," "physiology," and "body" emerge as central nodes, reflecting their significance within the overall research topic. Additionally, keywords such as "inflammation," "cortisol," "anxiety," and "depression" highlight the focus on the physiological mechanisms and psychological implications of stress.

The network also reveals the presence of keywords related to specific physiological systems and conditions, such as "cardiovascular," "immune system," and "hypertension." This finding aligns with the existing literature, which has extensively explored the effects of stress on the cardiovascular and immune systems, as well as its potential role in the development of conditions like hypertension.

Furthermore, the co-occurrence of keywords like "exercise," "intervention," and "management" suggests that researchers are also investigating potential strategies and interventions to mitigate the negative impacts of stress on physiological functions. Overall, the keyword co-occurrence network provided by VOSviewer offers a comprehensive overview of the research landscape and the interconnected themes within the study of stress and its physiological consequences on the human body. This visualization aids in identifying emerging trends, knowledge gaps, and potential areas for future exploration, ultimately contributing to a deeper understanding of this critical research domain.

studied topics, although a lot of research has been done. This suggests that there is still room for further research, especially in environments like Indonesia. Keyword analysis shows the latest research trends and areas where further research can be done. The emergence of certain keywords more often indicates the path of future research.

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