

Contemporary scientific rationality and health: critical reflections in light of the Dialectic of Enlightenment

Racionalidade científica contemporânea e saúde: reflexões críticas à luz da Dialética do Esclarecimento

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ABSTRACT

While contemporary scientific rationality has driven significant advances in health, it also presents contradictions linked to the instrumentalization of reason, the fragmentation of knowledge, and the influence of economic, institutional, and ideological interests. This study aimed to reflect on contemporary rationality in health in light of Adorno and Horkheimer's Dialectic of Enlightenment, considering its ethical, social, and epistemological implications. It is a theoretical-reflective essay with a qualitative approach, grounded in an interpretive analysis of the work and a dialogue with contemporary literature on science, technology, and health. Five analytical categories were developed. The results demonstrated that instrumental rationality can reduce complex phenomena to measurable variables, foster the fragmentation of care, and shape scientific priorities according to power dynamics and economic interests. The study concludes that contemporary scientific rationality, while essential for the advancement of health knowledge, requires a critical, ethical, and interdisciplinary perspective that acknowledges its social, political, and economic dimensions.

RESUMO

A racionalidade científica contemporânea, embora tenha impulsionado avanços significativos na saúde, também apresenta contradições relacionadas à instrumentalização da razão, à fragmentação do conhecimento e à influência de interesses econômicos, institucionais e ideológicos. Este estudo teve como objetivo refletir sobre a racionalidade contemporânea em saúde, à luz da Dialética do Esclarecimento, de Adorno e Horkheimer, considerando suas implicações éticas, sociais e epistemológicas. Trata-se de um ensaio teórico-reflexivo, de abordagem qualitativa, fundamentado em análise interpretativa da obra e diálogo com a literatura contemporânea sobre ciência, tecnologia e saúde. Foram desenvolvidas cinco categorias analíticas. Os resultados evidenciaram que a racionalidade instrumental pode reduzir fenômenos complexos a variáveis mensuráveis, favorecer a fragmentação do cuidado e influenciar prioridades científicas conforme relações de poder e interesses econômicos. Conclui-se que a racionalidade científica contemporânea, embora essencial ao avanço do conhecimento em saúde, requer uma perspectiva crítica, ética e interdisciplinar que reconheça suas dimensões sociais, políticas e econômicas.

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Introduction

Contemporary science, grounded in the Enlightenment, is characterized by the valuing of rationality. Consequently, science moved away from subjective explanations and came to rely on objectivity and verifiability. For Adorno and Horkheimer (1985), these tools are essential for generating knowledge and reorganizing societies.

In this context, Western rationality established itself as the foundation of modern scientific thought. This is evident in the expansion of various fields, particularly in human health and care practices (Clavey, 2023). Despite these advances, criticisms have emerged regarding how reason—viewed as an instrument of emancipation—can also serve technical and instrumental functions. According to Adorno and Horkheimer (1985), while modern rationality liberates humanity from alienation, it simultaneously creates new forms of domination through social control and productivism.

From this critical perspective, it is pertinent to reflect on how contemporary scientific rationality is organized and what factors influence knowledge production. In the field of health sciences, a scenario emerges where technological advancement and scientific specialization coexist with ethical, social, and institutional challenges regarding the production, funding, and application of knowledge (Allison, Wang & Kaminsky, 2021).

Clavey (2023), in a study on critical theory regarding institutional antisemitism, highlighted how institutional, economic, or ideological interests interfere with scientific research, thereby dictating investment in specific areas of science.

Despite the advances of modern science, contemporary scientific rationality faces economic, institutional, technocratic, and productivist pressures, particularly in the health sector. There remains a need for critical analyses that link epistemological foundations to practical implications for health systems and the setting of research priorities.

Thus, the guiding question of this study is: How does the critique of contemporary rationality enable an understanding of the challenges and contradictions inherent in the scientific production of knowledge in health?

In light of the foregoing, the objective of this study is to reflect on contemporary rationality in health, viewed through the lens of the *Dialectic of Enlightenment*, and to understand the ethical, social, and epistemological implications for the production of scientific knowledge.

Methodological procedures

This is a theoretical-reflective essay with a qualitative approach, grounded in the *Dialectic of Enlightenment* (Adorno & Horkheimer, 1985), which analyzes contradictions related to scientific rationality and the contemporary historical, social, and economic context.

The inquiry that motivated this study arose from discussions held during the "Seminars I" course (2026.1) within the Doctoral Program in Biology Applied to Health at the Federal University of Pernambuco. In this context, reading and critically debating the aforementioned work prompted reflections on the contradictions inherent in the rational project of modernity and their repercussions on scientific output.

An in-depth reading of Adorno and Horkheimer's "*Dialectic of Enlightenment*" (1985) was conducted, alongside an interpretive analysis of the text, aligned with the state-of-the-art discussion on ethics, science, and knowledge production. Consequently, five discursive categories were developed: (I) Introduction to the *Dialectic of Enlightenment*; (II) Western rationality and the transformation of reason into an instrument; (III) Modern science and the fragmentation of knowledge; (IV) Science, technology, and power relations; and (V) Scientific neutrality: is it possible?

The analysis was guided by a hermeneutic process. The work's central concepts were linked to contemporary literature on science, technology, and health. The analytical categories were defined following a detailed reading of the theoretical framework and a dialogue with the field of collective health.

Results and Discussions

An Introduction to Dialectic of Enlightenment

Dialectics is a philosophical method of analysis that seeks to understand reality based on the contradictions and internal movements that constitute social, historical, and intellectual phenomena. Unlike linear or static approaches, this method is grounded in the principle that human and social processes unfold through tensions, conflicts, and continuous transformations. This mode of thought was influenced by critics who applied dialectics to analyze the contradictions of modernity (Adorno & Horkheimer, 1985).

In *Dialectic of Enlightenment*, Adorno and Horkheimer (1985) apply the dialectical method to analyze the Enlightenment project. They argue that the Enlightenment aimed to liberate humanity from superstition and mythical domination through reason. However, it also generated new forms of social and cultural domination. Thus, the work highlights its central contradiction: reason, idealized as a means of emancipation, transforms into instrumental rationality, fostering structures of control and alienation.

This dialectical perspective applies to the understanding of modern science. Science is one of the primary outcomes of the Enlightenment project. It has driven advances in medicine, technology, and the understanding of nature (Clavey, 2023). Yet, under dialectical analysis, these advances coexist with tensions and paradoxes, such as the influence of economic, ideological, and institutional interests on knowledge production.

According to Adorno and Horkheimer (1985), dialectics constitutes a historical and social field marked by contradictions. In this context, the authors introduce the diachronic dimension inherent in the ethical, political, social, and economic challenges associated with the advancement of knowledge.

Western rationality and the transformation of reason into an instrument

According to Adorno and Horkheimer (1985), the Enlightenment represented a historical attempt at emancipation grounded in a reliance on reason. However, over the course of modernization, this reason was reduced to a productivist logic.

Modern Western rationality transformed into instrumental rationality. Its primary function became the domination of nature and the organization of society based on technical criteria (Adorno & Horkheimer, 1985; Clavey, 2023).

This analysis raises significant questions for contemporary scientific inquiry. If the goal of science is to produce true knowledge and foster human progress, to what extent might the emphasis on measurement, standardization, and control reduce the complexity of reality? Can the pursuit of absolute objectivity lead to the exclusion of the subjective dimensions of knowledge?

The critique developed by Adorno and Horkheimer (1985) is not directed at reason itself, but rather at its transformation into a strictly instrumental rationality. When this logic comes to predominantly guide scientific production and institutional practices, there is a risk that complex phenomena will be reduced to measurable variables, thereby sidelining the social, ethical, and human dimensions of knowledge.

According to Clavey (2023), instrumental rationality presents itself as a worldview of modernity. In their study, the authors describe antisemitism as a complex ideology embodied by the incongruities of our contemporary society.

Modern science and the fragmentation of knowledge

Another important aspect discussed in the work concerns the process of scientific knowledge specialization. Western rationality has fostered extraordinary advances across various fields of knowledge, yet at the cost of increasing epistemological fragmentation (Adorno & Horkheimer, 1985).

The close relationship between the biomedical model and modern Cartesian rationalism shapes a framework for health practices and care centered on treating disease,

highlighting a fragmented perception of care and of the expanded concept of health (Registro et al., 2025; Wang et al., 2022; Kumar et al., 2025).

Is it possible to fully understand the process of human illness based solely on biological variables? To what extent does medical hyper-specialization hinder a holistic understanding of the patient as a historical, social, and psychological subject? These critiques demonstrate that instrumental rationality tends to reduce complex phenomena to operational categories, which may limit the reflective capacity of science itself.

Science, technology, and power relations

Another central element of the analysis presented in the work *Dialectic of Enlightenment* concerns the relationship between knowledge, technology, and social power. For Adorno and Horkheimer (1985), technical progress does not occur in a political or economic vacuum; rather, it is deeply integrated into the power structures of modern society.

This approach is particularly relevant when analyzing the evolution of contemporary medicine. Technological progress has significantly expanded diagnostic and therapeutic capabilities (Wang et al., 2022; Kumar et al., 2025); however, it has also contributed to the strengthening of phenomena such as medicalization (Maldonado & Camargo Júnior, 2026) and an increasing reliance on ever more sophisticated technologies (Zanete, 2026).

In light of this, the indicators of productivity, impact, and technological innovation valued in contemporary science reinforce the concept of instrumental rationality (Adorno & Horkheimer, 1985).

In the healthcare sector, the emphasis placed on experimental research involving high-cost technologies and resources can influence the setting of scientific priorities. In this context, certain research agendas may align with neoliberal economic interests, while issues related to health promotion and addressing inequities receive less attention. This demonstrates that the production of scientific knowledge is not a wholly neutral process but is shaped by power relations that influence both the choice of research topics and the ways in which that knowledge is applied in practice.

Scientific neutrality: is it possible?

As seen in the previous category, scientific neutrality—while serving as a regulatory ideal—faces limitations when confronted with the social nature of science (Adorno & Horkheimer, 1985). Studies indicate that factors such as funding, institutional policies, and economic interests influence the setting of research agendas and the interpretation of results (Allison, Wang & Kaminsky, 2021).

First, the very definition of what is to be researched involves non-neutral choices. Research agendas are often shaped by societal priorities, economic interests, public policies,

and the availability of funding. Consequently, certain fields receive more attention and resources than others (Allison, Wang & Kaminsky, 2021).

In the health sector, a notable issue is the prioritization of resources for research aligned with neoliberal market interests, often at the expense of research aimed at addressing the health problems of vulnerable populations (Nader & Ribeiro, 2025).

From another perspective, questions arise regarding the viability of the concept of scientific neutrality when the very institutional structures meant to ensure the conditions for knowledge production begin to restrict them (Thorp, 2024).

Successive budget cuts and resource restrictions over the past decade have led to the precariousness of research and the erosion of autonomy within Brazilian public universities. Indeed, the interplay between research autonomy and a structure of underfunding in public universities challenges the neutrality of scientific knowledge production, reflecting institutional priorities and decisions that shape the direction of academic research (Serafim, Dias & Etulain, 2021; Amaral, Silva Júnior & Salles, 2025).

However, science has established itself based on methodological principles aimed at ensuring the originality, objectivity, verifiability, and reproducibility of knowledge. Scientific knowledge must be built upon evidence, critical analysis, and systematic methods.

Research influenced by sociocultural aspects, ideology, or religiosity compromises scientific validity, as such work may be refuted or fail to rely on measurable criteria (Allison, Wang & Kaminsky, 2021).

Another important point raised by Zanato et al. (2026) concerns confirmation bias, wherein researchers prioritize data and interpretations that confirm their own worldview, ideology, and religious beliefs, thereby undermining the reliability of findings and the production of knowledge. Consequently, scientific practices may also be applied in restrictive ways, affecting respect for diversity and equity.

Historically, ideologies or beliefs have hindered scientific development through the refutation of theories, restrictions on academic freedom, and the dissemination of pseudoscientific information aligned with specific interests and denialist agendas (Sheldon, 2016; Rodrigues, Lorenzetti, & Selles, 2025; Souza & Dias, 2025; Zanato et al., 2026).

Thus, within the scientific realm, secularity is best understood as a principle of coexistence among diverse perspectives rather than an attempt to exclude the religious. Science is built upon rigorous methods that preserve its autonomy without necessarily cutting off dialogue with cultures and religions. When these traditions are translated into accessible, rational language, they can contribute to significant ethical reflections, particularly in fields such as bioethics (Souza & Dias, 2025).

Conversely, sidelining the religious dimension in the name of a supposed scientific neutrality weakens academic debate and reduces the university to an excessively technical environment (Souza & Dias, 2025). Enabling dialogue between them does not mean reverting

to forms of theological dominance, but rather broadening the repertoire of perspectives that underpin their values, such as human dignity and social responsibility. It is worth recalling that science develops within a pluralistic environment rich in democratic debate.

Although it is widely accepted that absolute neutrality is unattainable, it is the researcher's duty to adopt methodologies and an ethical stance that help minimize the interference of personal beliefs and values (Thorp, 2024). Thus, certain practices become crucial in the researcher's daily work, such as providing a detailed explanation of the methods employed, presenting data transparently, and disclosing study limitations and any potential conflicts of interest.

Likewise, strategies such as peer review, randomization, and the reproducibility of results are of great importance. Together, these tactics strengthen the credibility of the findings, ensuring their consistency (Santos et al., 2024).

Even though science is not entirely neutral, it establishes robust collective and methodological mechanisms to strive for the highest possible degree of objectivity. The debate regarding values, beliefs, and science must be conducted based on methodological and ethical frameworks that ensure the primacy of evidence and rational argumentation, while preserving the public and universal nature of scientific knowledge.

Final Thoughts

The analysis based on the work *Dialectic of Enlightenment* reveals that modern scientific rationality, despite yielding extraordinary advances for humanity, harbors a structural ambiguity. Indeed, contemporary science is influenced by social and economic factors—including ideological, political, and economic forces—that impact both scientific priorities and technological applications.

The study confirms that scientific production often prioritizes highly specialized research, such as the search for new molecules or biomedical technologies, while broader strategies for health promotion, disease prevention, and the improvement of social conditions receive less attention and funding. This trend may reflect the influence of contemporary capitalist economic dynamics on science. Furthermore, the study observes that the introduction of personal ideologies, religious beliefs, or economic interests into scientific practice can compromise the objectivity of knowledge and introduce biases that undermine science's ethical commitment to human dignity.

In light of this evidence, the present study expands the debate on scientific rationality by linking critical theory to the field of health, highlighting how instrumental logic can influence scientific and care practices. From a practical standpoint, the findings underscore the need for scientific policies that value integrated, interdisciplinary, and socially oriented approaches, particularly in contexts of health inequality.

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